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SECURITY ACCESSORIES

Add an extra layer of safety to your computing, with these handy accessories...

The days of having an easily broken padlock or chain as your only security device are long gone, and it's all thanks to computerisation. Smart accessories and device-level encryption means that it's now easier than ever to protect your hardware and the data on it from being stolen or intercepted – and to prove that, we've taken a look at some of our favourite security-based accessories for your PC, laptop, smartphone or tablet.

Bluetooth Security

If you've read some of the other pieces in this issue, you'll know that Bluetooth can be useful for security thanks to its close-range optimisations and device-specific pairing. But it isn't just keyless doors that Bluetooth is useful for: it also works for other accessories. Bluetooth tags use it to determine if your valuables are in a specific range, while Bluetooth padlocks turn virtually any lockable device into a keyless one.

Tile, Gen 2

The second-generation Tile is a Bluetooth tag that you can attach to any piece of hardware (or, indeed, a bag, pet, car or person), in order to ensure that it doesn't get taken from you without you realising. An update of the successful Tile (which was originally crowdfunded in June 2013), it includes a louder speaker and a reverse-locate function to help you find your phone.

Using the Tile is simple: pair it with your phone and then load up the associated app. There are apps for both Android and iOS, and as soon as the hardware is paired, you can use the app to keep track of the device's location on a map. Low-Energy Bluetooth has a range of up to 150 feet, so it's generally not a problem that you'll go out of range if you're staying in one place, but as soon as the object disappears from 'view', the map will show you where it was when it disappeared, so you can start searching.

An alarm helps you locate the device if it goes missing, and the reverse locate function means you can press the tag and get an audio alert on your phone (even if it's on silent) to find it. One great feature is 'community find', which allows phones running the Tile app to log the location of other Tile devices that come into range of them. That way, if you lose the item with your Tile tag on and someone takes it past another Tile user, you'll be seamlessly and invisibly notified. We're not sure Tile is being widely used enough to make this feature work quite as well as it could, but it certainly doesn't hurt for it to exist.

Ultimately, for £20 it's a good investment and helps you turn any valuable into something with some level of smart security, which can't be a bad thing. Although it's slightly bulky, especially compared to some of the competition, its low price and wide availability (they're sold in Tesco stores!) make it a choice that stands out from the field.

Noke Padlock

Pronounced 'no key', the Noke Padlock is a keyless padlock that uses Bluetooth instead of a key – so if you want to make sure your locker, bag, tent or similarly lockable storage area remains secured even from the most fastidious lockpicker, this might be what you need. No combinations to forget, no keys to lose, it's about as secure and seamless as it could possibly be.

An app for Android or iOS gives you the option to manage your lock remotely, so you can release it even before you've reached it – ideal if you're trying to unlock your bike in the rain and don't want to stand there fiddling while you get drenched, for instance. You don't even have to unlock it manually – the padlock can open as soon as you're nearby, though only you'll know for sure!

The battery (a standard 2032 watch battery) lasts for a solid year and alerts you when it gets low enough to warrant replacement, so you'll never be left with a locked, unopenable padlock. Should anything go wrong and your phone battery dies, you can still open it manually thanks to a 'quick click' combination that you set beforehand. The pattern of button clicks unlocks the padlock, so it's basically uncrackable. Meanwhile, the lock itself is rugged and can handle a few knocks, with all its sensors and buttons kept in a solid, weather-proof case made of boron-hardened steel.

Better still, the companion app can be downloaded by others, so you can share your lock with friends if you want them to have access without cutting multiple keys. You can also set security levels so additional steps are required to open the lock, and a history feature can tell you who unlocked your lock and when.

At £59.99, it's a fairly steep buy, but its versatility hopefully makes up for any price considerations. If you like the idea, it's also going to be possible to buy a Noke bike lock in the near future, providing better support for cyclists who want their bike smart-locked. We don't know about you, but that sounds like a good thing to us.

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Secure Storage

Keeping your data secure is important. Whether you're worried about identity theft or you're working on something that absolutely can't get into the wrong hands, secure storage solutions allow you to transport your data from place to place without having to worry about what might happen if it gets lost. Here are just a couple of examples worth looking at if you want to keep your data safe.

"Smart accessories and device-level encryption means that it's now easier than ever to protect your hardware"

Kingston Technology DataTraveler Locker+ G3

Compared to the storage media of the past there's almost nothing to hate about flash drives, bar the fact that they're easy to lose. Whether left on a train, dropped in the street or slipped from your pocket by an opportunistic thief, an errant USB key can cause considerable stress – not least because of the idea that someone else might be rifling through data that you intended to keep private.

So don't let the mouthful of a name put you off here: the Kingston Technology DataTraveler Locker+ G3 is a decent entry-level piece of security storage hardware for anyone concerned about security. Its big selling point is its 256-bit AES hardware encryption, which prevents all unauthorised access using a password-protection software system. Even if someone tried to access the flash storage on a component level to circumvent the safety features, they'd get nothing but gibberish out.

The password system is built into the drive's decryption software, but it requires no special drivers or installation. This does mean that the storage only works with Windows and Mac, because those are the only operating systems capable of running the software it contains. While you might be able to get it to work on Linux, be warned that it's not going to be compatible with most non-standard systems, such as games consoles or set-top boxes.

Should the drive be stolen, the software will wipe the storage contents after ten invalid logins, which is nowhere near enough time to perform a brute-force attack. Even if this happens, you don't have to lose your data because an automatic USBtoCloud backup service provided by ClevX can ensure there's an online copy of the drive's contents, so you can access or restore them in the event of a disaster.

Physically, the drive is also built for security. It has a durable metal casing to protect it from exterior damage, and a built-in key look allows you to secure it in transit. The USB plug is also covered by a cap that connects to the rear of the drive for safe-keeping. A five-year warranty is designed to offer peace of mind, and purchasing the drive also entitles you to free technical support. It's a USB 3.0 drive, so it's not just secure – it's fast too.

Price-wise, it's also incredibly reasonable given the high-grade protection on offer. The 8GB version is available for £9, the 16GB version is £14, the 32GB is £23, and the largest 64GB version is £46. If you're thinking of buying one, that makes the 16GB version the best value, but the 32GB arguably has the best balance between price and capacity, even though it's no better than the 64GB version.

iStorage DiskAshur

If you want a storage solution that takes security and capacity to the next level, the iStorage DiskAshur is one of the few fully encrypted external storage drives available with terabyte-level storage available. These external USB drives require no additional power source other than the built-in USB connection and contain the same hardware keypad as DataShur's popular USB keys,

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“Whether left on a train, dropped in the street or slipped from your pocket by an opportunistic thief, an errant USB key can cause considerable stress”

albeit in a larger form. A huge number of security features – most notably tiered access codes and anti-hacking lockdown mechanisms – are also included, and the encryption is performed in hardware to prevent the security measures being bypassed at all. Even though it's a mechanical hard drive, the extra protection doesn't slow down access at all.

Additional features unique to this drive include a self-destruct password, so you can instantly wipe the data on a drive, and a full reset password that wipes all the data and access codes so the hardware is essentially back in factory condition. The keypad is wear-resistant, so there's no likelihood of worn numbers alerting anyone to the code currently in use, and the case has omni-directional anti-shock mountings and rubberised exterior to prevent data loss from knocks and falls.

Notably, the DiskAshur is available with two levels of encryption. Models with 128-bit encryption are generally cheaper and functionally no less secure (at least for the immediate future), but models with 256-bit encryption aren't unreasonably more expensive once you've decided to shell out this much for a secure drive.

The smallest version of the drive is a 250GB version costing £128, while pricing snakes upwards towards the 2TB version which costs more than twice that amount, at £290. As you can tell from that pricing, the cheapest versions are the worst value, and we think the best balance between price and capacity is found around the 500GB model, which costs £150-£160 depending on the level on encryption you choose.

Again, the DiskAshur is considerably more expensive than a standard unencrypted drive, but its hardware encryption features mean you can use it in any device and be sure your data remains secure. It's fast, powerful and not too expensive, which makes it great for anyone looking for high-capacity secure storage.

Hopefully, this features has given you a good idea of the security-focused hardware accessories that are out there and how you can use technology to secure both your data and your devices. Of course nothing's a good substitute for vigilance, but maybe this stuff is the next best thing! **mm**

How To Make Your Own Secure Storage

Although it's hard to build a USB drive with the same hardware encryption features as some of the hardware featured in this guide, that doesn't mean that encrypted storage is completely out of reach. A combination of a standard USB key and a file-encryption program can create storage that's as functionally secure, if not as outright functional as anything with hardware encryption.

Although for years the standard tool for drive encryption was TrueCrypt, the software was dramatically removed from development, with developers abruptly claiming that they'd lost interest in the software. Despite that, some organisations argue that TrueCrypt 7.1a, the last stable release, is still a safe choice for encryption. (Note that version 7.2 exists, but is designed to help you migrate to another encryption package.)

There's no consensus for a TrueCrypt successor, but VeraCrypt is a fork of the (open-source) software, which is achieving some prominence. VeraCrypt fixes many bugs found in TrueCrypt, but isn't fully compatible with its volumes due to the modifications. It also hasn't undergone the auditing process that made TrueCrypt so popular, so there's no guarantee that it's secure other than the developer's word.

It's also possible that your operating system has encryption features built in. If you're using Windows 8.1, then you might have access to a Device Encryption option, but this is limited to new installations and only on certain hardware. Windows 8 and 8.1 Professional versions include BitLocker encryption, as does Windows 7 Ultimate.

Regardless of what software you choose to employ, you can use any of these to encrypt the contents of a USB drive and effectively create secure storage. It won't work on any non-Windows system, and it won't have the military-grade self-destruct features and hardware-encryption features that make encrypted storage so attractive. But if you want to prevent your files getting looked at by amateur snoopers, this type of solution is both effective and affordable.

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THE BEST IP CAMERAS

Keep an eye on your property, no matter where you are in the world

Whether you're interested in monitoring what's happening in and around your home for security reasons or practical reasons, having access to your own form of video camera monitoring was previously a luxury only available to the incredibly rich. These days, it's far more affordable thanks to IP cameras.

Like any computer hardware, there's a lot about IP cameras that has to be considered before you buy one – not least learning what they can actually do and how they do it. If you're considering some kind of home monitoring solution, the next few pages should give you all the information you need to make an informed decision about the IP camera hardware that's right for you.

IP Camera Basics

The first thing you need to know is how IP cameras differ from a traditional CCTV network. In CCTV, a video signal is transmitted over a coaxial cable to a recorder – previously a video recorder, but these days it's more likely to a digital one. This closed circuit makes the signal reliable and hard to intercept, but it does mean that it's hard to install in the home without specialist help.

Unlike standard CCTV, IP cameras transmit a signal over an existing network connection instead. These devices can be attached to either wi-fi or cabled Ethernet, but in any case, the digital signal is instead relayed to a network video recorder – a device that has an IP address and limited two-way communication abilities.

As a result, IP cameras have a huge number of advantages, especially in the context of home use. They don't require much, if any, installation beyond switching them on. They're cheaper, so you don't have to invest as much to see if it's even worth buying them, and they're more adaptable, meaning you can easily repurpose them around your home without much hassle.

While the most high-end models incorporate their own recording unit, which will store a video feed for a specified amount of time, most home models tend to provide just a live video feed, which can be viewed from any network-capable PC or smart device. Most allow some level of remote control, so you can activate and deactivate them, as well as rotate their positioning and switch modes. Indeed, without the controller apps, most of these cameras won't do much at all!

Additional features you can expect include things like motion-sensitive activation, infra-red vision and live audio – sometimes even two-way! The vast majority of cameras can now be controlled using a smartphone app or web interface, meaning it's even possible to control them from outside the home.

Of course, there are disadvantages associated with IP cameras. Live video feeds tend to be high resolution and therefore incredibly large in size. If the data isn't being recorded onto the camera, this could have the knock-on effect of congesting network traffic as well. Similarly, cameras require a power source, so they may be difficult to install outdoors.

IP Camera Uses

There are lots of ways to use IP cameras, but in case you're not sure how they might fit into your life, here are some common reasons people might want one.

Home Security: Keeping your house safe is the obvious use of a security camera, whether you're using it to monitor your home while you're away, keen an eye on your garden at night, or check who's at the front door before you answer it. At best, the presence of a camera will be preventative – at worst, they'll help you get a good look at any criminals.

Baby Monitoring: One of the next most common reasons to buy a cheap IP camera is that they're often no more expensive than the average baby monitor system, and typically a lot more versatile. Using an IP camera, you can check on a sleeping child without having to tiptoe around the creaking floorboards.

Pet Monitoring: If you find it stressful to leave a pet at home alone or want to make sure they aren't causing trouble when you're in another part of the house, an IP camera can give you a means to check whether they're okay and answer the biggest pet-owner mystery of them all: what they're doing while you're not around.

Videophone: If you've got a large house, work outdoors or you just want to avoid going all the way down from the office to the door to find out you're being interrupted to take a survey, you can use an IP camera's two-way communication to talk to someone anywhere on your wireless network. Better still, if you use the online connectivity, you can use it to convince people that you're in your house even when you're not.

Features to Look For

We've mentioned some of these already, but when you're looking to buy an IP camera, these are the features you want to take into consideration:

Lens Type: Larger lenses are better for outdoor use. A standard indoor camera needs at least a 3.6mm lens to give it good focus within the average size of a room, but for outdoor cameras you'll want anything from 6mm to 12mm.

> **“The first thing you need to know is how IP cameras differ from a traditional CCTV network”**

Resolution: Generally speaking, the higher the resolution, the better, although there is such a thing as too high. 4K video might be the gold standard for your phone or digital camera, but it risks taxing the bandwidth and/or storage capacity of most modern networks. Resolutions around 720p are good, 1080p is ideal, but don't go higher unless you're using gigabit Ethernet or wireless AC wi-fi.

Compression: This determines the quality of a streamed image. MJPEG is generally used for smaller images, but high-resolution ones employ higher-quality H.264 encoding technology. The former is fine on low-bandwidth networks but doesn't scale well. The latter is a newer and more powerful form of compression, better suited to high-bandwidth video and networks.

Pan, Tilt & Zoom: Sometimes abbreviated to PTZ, these reflect the movement options of the camera's field of vision. The first two will probably be given in a range of degrees (e.g. 360° pan would mean it could see in a complete circle around itself), so the higher, the better – although tilt probably won't be more than 120°, because it's hard to have a camera that points directly up or down (and not especially useful either!) Finally, as with standard digital cameras, zoom can be digital or optical and will be given in a magnification number. Optical zoom is clearer and more desirable.

Infra-red / Night Vision: If a camera has these features to allow it to see in the dark, you need to pay attention to the number of LED sensors listed. The more there are, the better and brighter the image the camera will receive.

One-way/Two-way Audio: If a camera has one-way audio monitoring, it means you can hear what's happening at its location, which is useful for baby monitoring, for example. If the camera has two-way audio, it means there's a speaker on the camera that you

TP Link NC200

D-Link mydlink DCS-932L

can also send audio to using your smartphone or PC microphone. Take care, though: if the camera specs say that it is 'two-way capable', then it may mean it only has the necessary ports and needs to be connected to an external speaker or microphone to work fully.

Reviews

TP Link NC200 (£28)

You probably won't find a cheaper IP camera on the market, but there's plenty about the TP Link NC200 that makes it worth considering. As well as live-streaming over its own app and a web interface, it has cloud-based viewing, so you can access the visuals from anywhere on the internet, as well as motion sensing with email notifications. Additionally, the camera works as a wi-fi extender, so you can use it to expand your network coverage if you like.

Generally speaking, its specs aren't very high. It uses MJPEG compression and has just 4x digital zoom, though there is a built-in microphone and one-button WPS setup. The resolution is just 640 x 480, with a version small 0.3MP sensor and 3.85mm lens. Its wi-fi capabilities are only Wireless N, so not very fast either, but enough for a serviceable connection.

Ultimately, when you pay for a budget model of this kind, you know what to expect; it doesn't do anything brilliantly, but if you want a basic monitoring solution, it should be enough to get you familiar with the technology. At least then you can decide whether you want something more powerful and expensive.

D-Link mydlink DCS-932L (£35)

It isn't much more expensive than TP-Link's offering, but D-Link's pedigree makes this camera a much more solid purchase for someone looking to find a budget camera. As well as the standard features, like motion detection and email alerts, it has night-vision features, sound detection and zero-configuration options with mydlink-enabled routers.

> **"IP cameras have a huge number of advantages, especially in the context of home use"**

As a fixed, budget camera it's still fairly low-spec, however. The field of view both horizontally and vertically comes in at 45°, and it only captures 640 x 480 video at 20fps with MJPEG compression. You still get an app and web interface, but generally speaking, you're paying for the improved construction and more refined software rather than better capabilities when choosing it over the TP Link model. The problem is that at £35 it costs a lot more than the cheapest camera

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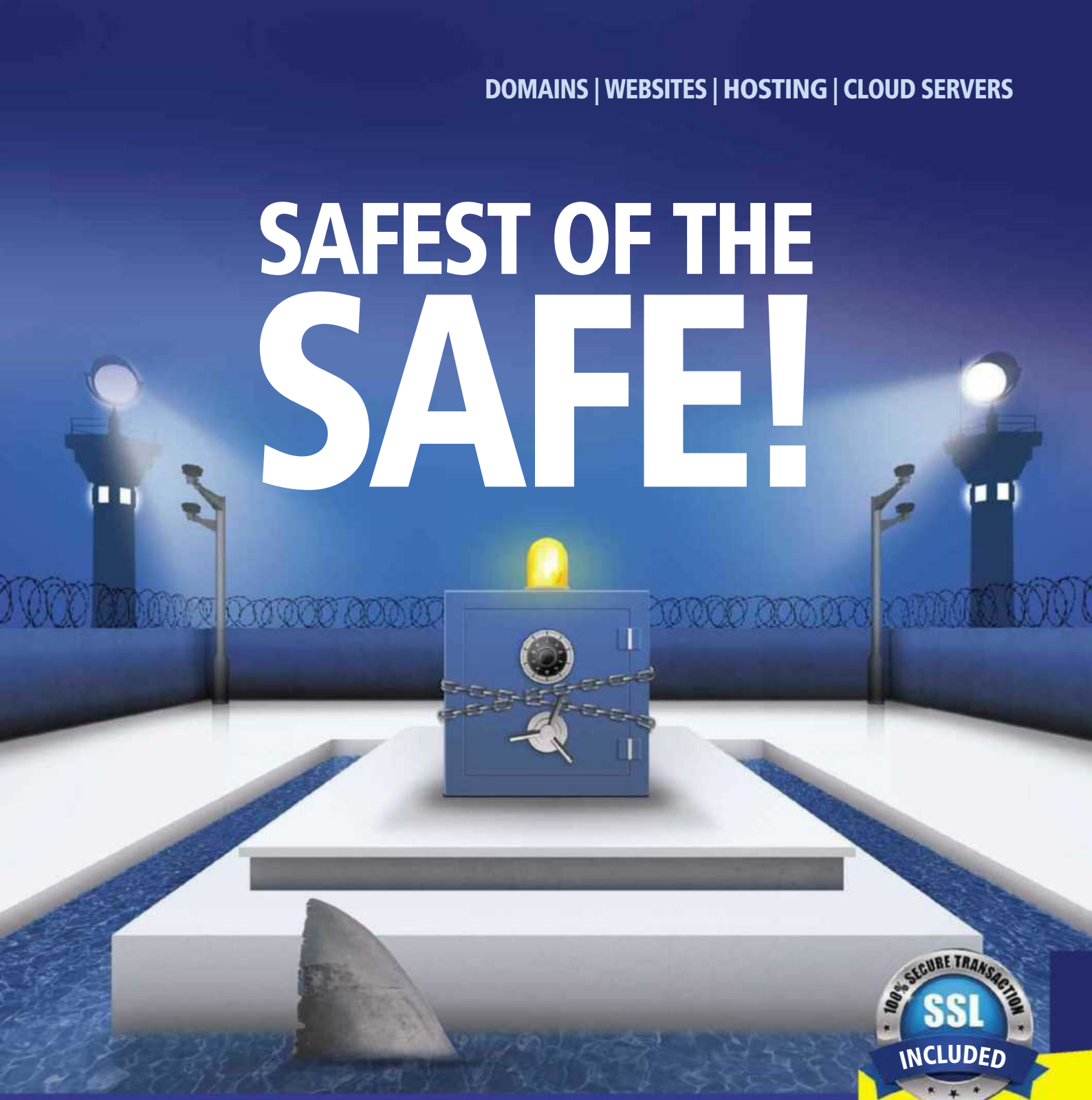

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Motorola Focus 66

D-Link DCS-5009L

but doesn't do a lot more. And if you're not interested in saving the money, it's hard to justify the lower specs as easily.

Motorola Focus 66 (£45)
This is a good example of what you can get just by paying a little more for your camera. This camera costs just a tenner more but has significantly upgraded capabilities, including 720p video, two-way communication and H.264 compression. Monitoring and communication are handled through the free Hubble app, which allows you to administer up to 10 cameras on a single network, and with a ball hinge base you can wall-mount then position the camera in a number of different orientations.

Infra-red night vision is also included at a distance of six metres, although this camera is strictly indoors, so there shouldn't be any difficulty caused by that range. Specs-wise it's a major step up from the cheaper cameras on this list, with a 1MP sensor, seven infrared LEDs, built-in speaker and microphone, and Wireless N connectivity. If you aren't determined to go for a super-cheap model, we'd suggest that this is a good place to start.

HomeGuard WIP811

D-Link DCS-5009L (£51)
The list of features on the DCS-5009L makes it the first camera on this list that we'd describe as a premium model. It's still Wireless N only, but as well as offering both H.264 and MJPEG compression (depending on the available network speed and picture size) it has motion-detection with email and FTP alerts, zero-configuration on mydlink routers, and WPS connectivity.

Video resolution is actually lower than Motorola's, but still 640 x 480 at 30fps, with a built-in microphone, eight-metre infra-red distance, and 66° viewing angle with a 170° panning range and a 95° tilt range. There are dedicated apps for iOS, Android and Windows Phone, and a web-access interface too.

At £51, it isn't too expensive either. Certainly it's significantly more capable than any cheaper camera on this list, even if the specs aren't universally higher. Ideal as a first IP camera or for someone more experienced – and the D-Link name doesn't hurt its pedigree either.

HomeGuard WIP811 (£76)
At £76, this camera is certainly priced like a high-end one, but HomeGuard's full HD camera is still one of the cheapest that offers 1080p video capture. Remotely controlled from your PC, smartphone or tablet system, it captures HD video at 30fps, has a built-in microphone and speaker for two-way communication, and a number of other great features, including the ability to record directly onto a removable SD card for stand-alone, networkless use (though the card isn't included).

As well as the standard motion-control and capture alerts, it has eight IR LEDs, giving it a five-metre night vision range, and a 3.5mm audio out interface so you can connect it to speakers or an additional audio capture device. It captures video in both H.264 and MJPEG, and has a huge range of movement too: a 350° pan range and a 100° tilt range. A 4.2mm lens makes it the biggest yet, which seems fair considering it's also the highest priced.

When it comes to IP cameras, there's always going to be further to go, but we think this is a good all-rounder at the high end of the market. Not so expensive it'll break the bank, but perhaps reassuringly costly. **mm**

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SECURING YOUR HARDWARE

Simple steps can make a huge difference...

Keeping your system secure, whether it's a laptop or desktop, is something that should always be in your mind – but what can you actually do? In this article, we'll share some security tips and practical advice that should help you keep your system inaccessible, whether it's being targeted by hackers, accessed by someone in your home/office or taken by thieves.

Disable The Mic/Webcam

It might sound paranoid, but unfortunately it isn't. If you've got a webcam and microphone set up on your laptop or desktop system (and let's face it, most people have at least one of those by this point, if not both) then it's always worth keeping them locked down so that you can be sure they aren't being maliciously exploited.

After all, it wasn't that long ago that Samsung Smart TVs were found to be broadcasting any speech they picked up – which is to say all of it – to a third party for processing. Officially, this was because a separate company was responsible for its voice recognition, but it does pose questions about what might have happened if someone had found a way to intercept the data en route.

Although microphones and webcams don't necessarily watch you by default, it's relatively trivial (in hacking terms) for someone to install software on your PC that gives them access to such input devices. There are numerous cases of hacked webcams being used to spy on people, and even blackmail them with the recordings. And who knows what sensitive data you might discuss without realising your microphone is relaying it to a malicious entity, be that a hacker or trolls?

Whether you simply unplug this hardware, put a piece of tape over an unused camera lens or disable the devices in your hardware settings, making sure input devices can't relay useful data without your explicit permission is just one way to maintain your personal privacy in the face of a system that could be monitoring more than you realise.

Secure Your OS

If your PC gets stolen or accessed without permission, the best way to keep your documents safe is to make sure they're already protected by a password. That means making sure

your operating system requires one to log on. Another benefit of this is that your files can't be accessed without the proper decryption key, even if someone bypasses Windows and reads the drive directly. That only applies to files kept in your user area, but that's where the most important ones should be by default.

This gives you a fairly simple way to protect your personal details even if you PC is stolen. As long as your Windows installation is passworded (and the password is sufficiently uncrackable) then the worst that'll happen is your files will get wiped (if the system is stolen) and be completely inaccessible (if unauthorised access is the problem).

Similarly, a good practise to get into is to lock devices when you're not sitting at them. This mostly applies in communal situations – using your computer at work, at school/university or in an Internet café, perhaps – but it does also mean making sure your computer can't be accessed by anyone who may have broken into your house while you're not around, or wandered into your room during a party.

Locking a device is important for two reasons: it protects your files, and it protects your online behaviour. If you step away from a device and someone else uses it, the authorities and/or owners only have your word that you weren't the one at the PC, should it be used for anything illegal. Even if it's your own system, an unauthorised user might take the opportunity to install malware so that they can access your system remotely later on. You don't have to be a spy to have a computer worth protecting, and when it's so easy to do – just press Windows Key + L – it's worth getting into the habit of doing it.

"With no encryption or security, the data passing through a wi-fi network is ripe for interception"

Secure Your Wi-fi

It may not be a very secure protocol in itself, but by properly managing wireless security systems you can easily encrypt the data and stop it reaching the prying eyes of those around you. Whatever your wireless network is used for, you need to have some form of security.

Modern routers ship with security enabled by default – but what's so bad about running an unsecured network? After all, you can find them being used in public, so why does it matter if you run one at home? Unsecured networks have only one real benefit – they're incredibly easy to connect to. Of course, this is also the thing that makes it such a poor choice for home use. With no encryption or security, the data passing through the network is ripe for interception, and can be captured by anyone using some very simple software tools.

On a more practical note, it means that others can use your broadband connection unimpeded. The consequences range from the minimal (your connection speed is slowed by extra traffic) to the financial (your broadband cap is exceeded, incurring top-up fees) to the most severe legal penalties (the person breaks the law using your connection, and it's traced back to your account).

With that in mind, having no security on your wireless network goes beyond being just a bad idea – it practically invites trouble. Connecting to an unsecured network without authorisation is illegal, but there's also an imperative for the owner of a network – i.e. you – to keep it secure.

If you're running a modern network, you should be using WPA2-PSK encryption at the very least. The 'PSK' part stands for 'pre-shared key' and refers to the 'personal' or 'home' version of WPA, where the passkey must be entered by each user to gain access. The alternative is 'WPA Enterprise', which uses a RADIUS server for authentication. As the name suggests, WPA Enterprise this is intended for use only on large business networks, and is designed to make managing a large number of wireless clients into a simpler process, rather than a more secure one.

Most modern routers come with WPA2 already enabled and the relevant key printed on a sticker or accompanying card. Although it isn't entirely necessary to change the WPA access key from its default, it can be useful – especially if you're worried about third parties who might have access to your router while you're not around.

The best practise for choosing a strong WPA key is very similar to that of choosing a strong password, requiring similar considerations. When coming up with a WPA key, try to devise one that meets the following criteria:

Long: Make it at least 13 characters in length. Any shorter will mean that brute force attacks are possible to complete within realistic time-frames. The more characters you add, the less likely it'll ever be cracked.

Memorable: While any string of characters will work as a key, if you make that string memorable then you won't have to write it down or save it on your computer in order to use it.

Original: As with passwords, you should ensure that you use a combination of numbers, letters and punctuation to create a WPA key, and that it isn't made up of real words that could turn up in a dictionary attack.

> **“A good security plan isn't just about having the mechanisms in place to prevent unauthorised access”**

A simple way to create a memorable passkey might be to take a memorable 'fake' word (perhaps an acrostic of your favourite song lyric, or a spoonerism of a famous quote) combine it with your birth date, then separate the segments by punctuation. As long as it's information that you (and anyone else using your network) can remember and that other people can't, it's secure enough to use.

While cracking a WPA passcode isn't impossible, it is time-consuming. If you suspect someone else is attempting to access your router then changing the WPA key will be enough to put them back at square one.

Altering your wi-fi's SSID (network name) to something generic is also a good idea. Most ISPs ship their routers with a network name that identifies the service provider, such as 'TalkTalk-4C8A50' or 'BTHub5-FJ6W'. This gives those attempting to access the router a starting point: they can narrow the device down to one of a few used by that ISP, and maybe even take advantage of any potential loopholes or exploits known for that device.

You also shouldn't make it possible to connect your SSID specifically to you, because you could unwittingly divulge things about yourself. For example, if your SSID contains your address and you switch the router off while on holiday, people might notice that it's missing and realise that your house is empty. If you use an uncommon name or online handle as your SSID, further details might only be a Google search away.

Choosing a network name to something random, which doesn't identify either you or the hardware, is a good way to keep your network secure. It shouldn't affect your day-to-day access adversely, either!

Keep Backups

A good security plan isn't just about having the mechanisms in place to prevent unauthorised access. It also means having the mechanisms in place to recover from an attack. Malware might infect your programs, ransomware might

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permanently block access to your files, and in the worst case scenario, malicious users might wipe the contents of your system completely. Solid backups won't stop any of that from happening, but they can certainly help to make the recovery process much easier on you.

Typically, it's recommended that users make regular backups because it helps them recover from catastrophic data loss, but if you get into the habit it'll also mean you have the ability to recover from an attack on your system in just a few clicks should you need to. Lost data, as long as it is saved, can be easily restored. What's more, you may be able to wipe your system to get rid of malicious software safe in the knowledge that the important stuff won't be lost at the same time. If your PC or tablet is stolen, you can even use your backups as a guide for checking which accounts might need protecting in the immediate aftermath of the theft.

Scheduling and ensuring the integrity of backups is never a particularly glamourous thing to do. However, as far as protecting yourself goes, it's essential. Just remember to keep them on a hard drive or USB key that's out of sight of your main system – the last thing you want is your backup going AWOL too!

Don't Trust Public Wi-fi

Free wi-fi is great in theory, but in practise you have to be careful that you're actually connecting to the right network. It's a trivial matter to set up a hotspot that anyone can access, and just as trivial to use software that can intercept the traffic, which can lead directly to identity theft, credit card fraud and account hijacking.

This doesn't mean you have to avoid public wi-fi completely, but it does mean taking steps to protect yourself when you do use it. If you're using it in a business or other public establishment, always check with an employee that they have wi-fi and get them to tell you what the network name is. Look for login information. Even free and open hotspots usually ask you to input your details before you use it. A hotspot deigned to trap users might not, so if you find yourself able to log in without anyone trying to keep track of you, it's worth being a little suspicious.

When you are using a hotspot, don't make payments or input your address or personal details, and don't talk about sensitive or secure matters. At the very least, if you have to do these things then considering using a VPN tunnel to encrypt your traffic and make sure it's hidden from the prying eyes of whoever's running the hotspot.

Ultimately, if you're unsure, don't use the network at all. It's a good idea to find out how (and indeed whether) you can run your own personal hotspot using your mobile phone in order to use its mobile data allowance. It won't be as fast as public wi-fi, but it will be far more secure. **mm**

Keeping Software Secure

A system is only as secure as the software on it, so if you want to prevent your hardware from being hijacked or infected, you need to make sure you aren't falling prey to malware through exploits.

Although it's not the only way to install malware, a considerable amount of malicious programs attempt to enter a user's system without them realising. As the name suggests, exploits use opportunistic techniques to install software on the target system. Normally, this is a security hole such as a memory overrun or a credentials leak, which allows a script or program to execute code that would otherwise be prohibited. This code can then install the software as if it had received permission from the user to do so.

Due to their unintentional nature, when an exploit is discovered in a piece of software it tends to be repaired quickly. This is why updating software is crucial to maintaining security. Exploits are occasionally brought to developer's attention by 'white hat' hackers, who find them before they're employed by malware creators, but it's more common for an exploit to only be noticed once a piece of malware that uses it is released into the wild. Exploits that have just been discovered and not yet patched are known as '0-day' exploits, and are highly prized by hackers as they are difficult to protect against.

Although the process of locating and repairing exploits is well out of most users' hands, it is possible to reduce the effectiveness of exploits by keeping software up to date. You may wish to enable automatic updates to programs that support the feature, or employ a program like SuMo, Secunia PSI or FileHippo Update Manager to find instances where your software is out of date. The only way to prevent exploits being used is to ensure that they're unavailable when hackers try to employ them, and keeping your software current is the best way to do that.

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SMART LOCKS EXPLAINED

Bring your home security into the 21st century

One of the latest security gadgets to make its way into the home is the smart lock. Using connected technologies, smart locks allow you to open doors without the need for keys. But how do they work? Are they safe? And what are the benefits? Here, we'll tell you.

> **"You can have the option to lock and unlock your door completely remotely"**

How They Work

Rather than a physical key, smartlocks are opened using your phone, watch, tablet or other smart device. Generally, this means using an app to either send the lock a command to open using either Bluetooth or your home's existing wi-fi connection.

In theory, this gives you a huge number of additional benefits compared to a standard lock. For instance, you can create as many virtual 'keys' as you like. If you take a lodger, have a friend to stay or want your child to have their own access, you just create a key on the app and then assign it to them. If you ever want to revoke access, you can simply delete it. There's no concern about a key getting lost or forgotten so it allows anyone in, and even if the device is taken, you can remove its access in seconds.

Most smart locks go even further, allowing you to do things like set access restrictions by day or date, or assign temporary keys that only work for a limited time before self-deleting.

Some locks are operated entirely over software, but it's also possible to get locks that incorporate a hardware keypad. Input codes can still be managed by software and can typically be anywhere from four to ten digits in length. And there is, of course, typically a manual override in case your phone (or the smart lock itself) loses power for any reason.

Are They Safe?

Probably the biggest question any potential smart-lock buyer will ask themselves is the really obvious one: can it actually be trusted?

The connection between your lock and device is, in theory, uncrackable. Although it varies from device to device, you can expect at least 128-bit encryption, meaning that it's essentially impossible to crack and can't be intercepted. That alone means it's no less secure than a standard key, and probably a great deal more. It's not like there's a master code that'll work for every lock.

But that said, in practice, all locks are only secure until they aren't. If you decide to go for a smart lock, you're working

on the assumption that the hardware and software are both free from serious bugs and will remain so, which might be a big leap for some people.

Of course, even your normal front door lock is only notionally secure, so in that sense a smart lock is no worse than what you have now. Really, you buy a smart lock less because of security and more because of convenience.

Smart locks do have additional security features that other locks don't, though. They'll alert you if there are unauthorised access attempts (and, for that matter, authorised ones if you like). They can temporarily lock down completely if too many unauthorised access attempts are made. Some will even alert the authorities for you!

Any Other Features?

It depends on the hardware, but you can have the option to lock and unlock your door completely remotely if you want to allow access to an unexpected guest while you're not in. Some units incorporate a video camera and speaker so you can communicate with someone at your door, even giving the impression that you're inside your house when you're actually steaming your responses over the internet.

Some units also have an auto-unlock feature, so as soon as you're nearby, your house unlocks for you. What this actually means is that when you connect to your home wi-fi or come within Bluetooth range, it sends a command automatically. Likewise, if you leave your house and go out of range, the hardware can lock automatically as well.

Finally, some units have hardware key fobs, which can be used to unlock doors in an emergency, or by people who don't have smartphones.

The only tricky part is installation. The mechanism differs for every lock. Some replace the lock completely, incorporating a handle, where others simply fit into an existing locking mechanism in the door's interior. Some have sensors on both sides of the door, some just on one. There's no particular standard; it's all down to the make and manufacturer.

What Models Are Available?

Many of the most recognisable smart lock models (and indeed, product reviews) are US-centric, which can make researching them more difficult than it should be. For the last section of this guide, we're looking at a pair of smart locks you might want to buy, which are definitely on sale in the UK and compatible with standard locks and doors.

Kwikset Kevo 925

At almost £300, this smart lock is pretty pricy, but it has a lot of benefits that make attractive. It's a standard Yale lock, for example, so it's familiar as well as being connected. You can create unlimited eKeys for Android and iOS devices, and it comes with two master hardware keys and two unlocking keyfobs.

Installation is simple and can be done without any special tools, and the Kevo app provides plenty of stats and administration options. It's compatible with Google's Nest system. If you've got your smartphone on you, you don't even need to take it out of your pocket: just tap the lock and if the hardware is detected outside the door, it'll unlock automatically.

On the interior of your house, you get a simple unlocking lever so you don't have to use your phone while you're indoors, and access to the battery slot so you can replace the batteries easily when the time comes (and your phone will let you know when that time is getting near!)

Lockstate Wi-Fi Remotelock 500i

This lock is a fair amount cheaper at £230, but it incorporates a lot of the same hardware features. It's wi-fi enabled, so you can unlock your door remotely, it has access logs so you know who's been inside and when, and you can add and remove access codes using just your phone. Unlike the Kwikset lock, it doesn't use Bluetooth, so you have to enter a code manually to unlock it, but you do have the option of using a standard Yale-type key or going completely keyless if you prefer.

Unlike Kwikset's lock, it has a hardware keypad on the outside, so you can get in even if you don't own a smartphone (or have a key on you), and on the door's interior it has a standard latch and battery access.

Ultimately, it's not quite as smart – but the wi-fi capabilities mean it's still pretty futuristic, and again it's both fully compatible with standard UK locks and simple to install, as long as you know your way around a screwdriver. **mm**

WHAT TO DO IF YOUR PC GETS STOLEN

What are your next steps if thieves strike?

If the worst happens and your PC, laptop, smartphone or tablet gets stolen, you might wonder what you can do. Well, how you get it back is outside the realms of advice we can reasonably give you, but what we *can* tell you is what to do if and when the nightmare becomes a reality. Take it from us, in case someone takes your system from you.

Change Passwords

We imagine most people already know this, but it's always worth reiterating: if your PC gets stolen or seriously compromised, you should change your passwords immediately. Yes, it's a hassle, but if a criminal can access your online accounts, then they could do serious damage, from spending your money to committing identity theft.

Start with your main email account: it's the most valuable point of access for a hacker, because your other web accounts will all be linked to it. As long as it remains compromised, a person would be able to intercept any password changes and, even worse, reset them to their own. Only when your main account has been locked down should you bother changing any others.

Along similar lines, you may want to reset your security question too. It's possible that anyone with unauthorised access to your account could learn the answer (or change the question) so they can recover access. You want to make sure your account is completely impossible to access for anyone but you.

Speed is obviously of the essence. Don't wait until you've filed a police report or made it back home to change your password. As soon as you realise your PC is gone, go and do it. You should also use best practice. Anyone with your PC might have access to password lists or notes you keep, so pick something entirely new and unique to keep your accounts as secure as possible.

Sign Out Sessions

You might have changed your passwords, but that's only the first step towards keeping your online logins from being abused. The thing is, even if you've changed your passwords, there will be some sites where you stay logged in. The way that system works is that an active session remains active without requiring authentication, so even after you've changed your password, it's possible that your account is still logged in and accessible.

Luckily, some sites will force sessions to refresh if the password changes or if the computer's IP address changes (i.e. it's stolen and

“If your accounts get compromised, then it’s always a good idea to notify people who might be affected”

used somewhere else), but that doesn’t mean you can rely on that to happen. What you should do is find and forcibly log out of your existing sessions. Any good site should allow you to do this, though it might require a bit of searching.

On Gmail, for example, the option can be found by scrolling down to the bottom of your inbox, finding the link in the bottom right and clicking ‘details’ next to ‘last account activity’. Here you’ll see all the times your credentials have been used recently, and a button that logs out any active sessions other than your current one. Any other device in the world trying to access your account will now be forced to enter your password to continue – and if you’ve already changed it, they have no choice but to give up.

Notify People

As ever, if your accounts get compromised, then it’s always a good idea to notify people who might be affected. Obviously, it’s worth warning your bank or financial institutions to watch for fraud, but also put a note on your social media accounts. If people know there’s a chance they’ll receive messages from your accounts that might not be from you, they’ll be extra vigilant. They might also be able to let you know if they see you logged in at an unusual time or from an unusual place. At best, they might even be able to spot the person who took your device if they’re using it in public!

Basically, the more people who know that your computer has been taken, the lower the chance of them experiencing trouble as a result. It’s unlikely anyone who steals your PC will want to cause trouble with your life; most will just want to sell it on as quickly and discreetly as possible. But who knows where your system will end up?

Watch For Activity

Just as you should ask your friends to watch out for suspicious activity, so should you. Check when your accounts were last logged in, see if you’ve got messages marked as read that you haven’t previously see – that sort of thing.

If you’re looking for a mobile device, you might even be able to use tracking software to find it. On an iPhone or iPad, you can potentially use the ‘Find My iPhone’ feature, which can show you on a map where you system is (or last was) according to its GPS position, and allow you to control it to some extent. There’s a chance it’ll be accurate enough to show you exactly where to look (or, as in the case of one of my lost phones, it’ll turn up in Ethiopia three months later, then switched off forever).

On Android devices, the same feature is called ‘Android Device Manager’, and while most laptops and PCs don’t have any similar feature by default, if you think it’s likely to be a problem, you can install a program like LoJack (**www.lojack.com**) to get a similarly useful positional tracker out of it.

Restore From Your Backups

Er, you have been keeping backups, right?

Backups are a tricky subject. No one does them as often or as thoroughly as they should, but that doesn’t mean you shouldn’t do them at all. And most of the time, people only realise that after they’ve experienced the sort of event where backups would be a lot of help.

So we get it. They’re boring to do and you’ll probably never need them. If you feel that way, why not split the difference? Instead of making regular backups, pay money for a Dropbox (or other cloud service subscription) and just make sure that your important documents are always saved in those folders. You barely have to do any work, and your files will always be accessible even in the event of a serious theft (or hardware crash or, for that matter, a natural disaster).

Really, backups are the one thing you need to worry about if your PC gets stolen Hardware, no matter how expensive, can ultimately be replaced and programs re-downloaded. What’s valuable – what’s important – are the documents, photos, memories and information stored on it. And it’s well within your power to keep those safe, so don’t regret not doing it after the fact. **mm**

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Step By Step

How To Access The Dark Web

We delve into the hidden parts of the internet

The internet is a modern phenomenon that has grown well beyond the imagination of those who first envisioned it many years ago. On one hand, it's the world's most valuable resource – an incredible learning platform where, altruistically speaking, we can learn from each other's cultures, discover new areas of research, share ideas and knowledge and become better, more worldly people. You could look it as the gateway to the next step of human evolution.

On the other hand, and from a pessimistic point of view, where there are good human intentions there will inevitably be bad ones too. When it comes to the internet, this means the hidden parts, the parts that can found in what is known as the Dark Web.

As the sinister name perhaps suggests, the Dark Web plays host to some of the more vile and despicable aspects of humanity. This is where you'll find the trade of recreational drugs, weapons and even hitman services, as

well as hacking information, stolen credit card details and illegal pornographic images.

However, the Dark Web is also a place where individuals in totalitarian nations that block the web can access the outside world. This way, they can inform others of what's going on inside their country.

It's a double-edged sword, indeed, and for every honest use there are probably ten dishonest uses. But what exactly is the Dark Web?

The Deep Dark Web

Essentially, the Dark Web is an area of the internet that's hidden from the view of the usual search engines behind layers of anonymity.

The main bulk of the Dark Web uses the Tor network to anonymise and hide its identity from the rest of the world. Tor is a set of encryption tools, services and computer nodes that will hide and change your public IP address, as well as encrypt the data to and from your computer. By using it, as an individual, you are effectively hidden from those who monitor the internet.

When you apply that model to a web server, it has the same effect, so the content on that website can only be accessed by the Tor network – or similar – and its owners are safely anonymous.

There's a lot more to it, of course, and the various layers of how the IP address of the server is hidden is something which, from a networking engineer point of view, is really quite fascinating.

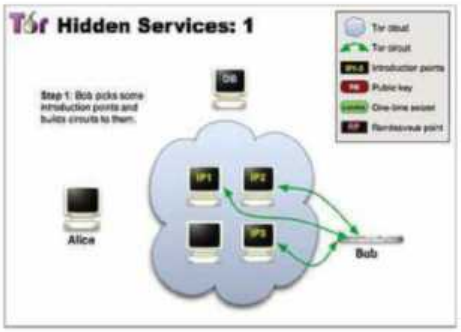
An infamous example of a Dark Web site is the Silk Road and the various evolutions of it that appear every time it's taken down or the perpetrators are dealt with. More recently, there was the hacking of Ashley Madison, where the names of users were published to an area of the Dark Web.

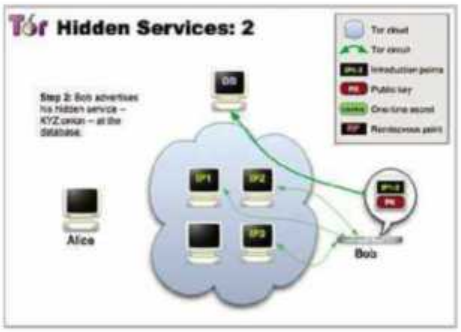
Importantly, though, the Dark Web isn't to be confused with the Deep Web or Invisible Web. On the surface, they're similar, in that normal search engines can't scour them, but the Deep Web is an area that houses research papers, university databases, company intranets, specialist forums and such. On the whole, it's a harmless environment.

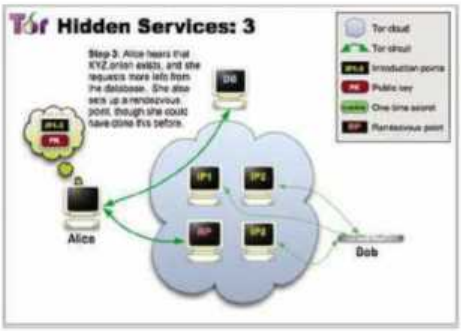
> **“The Dark Web hosts some of the more vile and despicable aspects of humanity”**

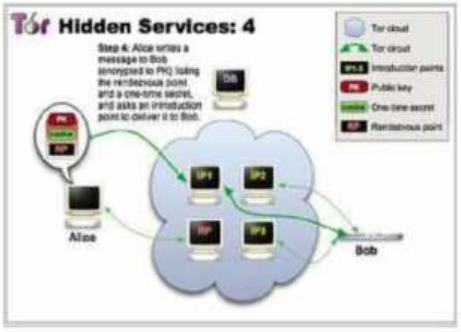
The Dark Web, though, is a little harder to access and, as we said, it includes stuff you really don't want to view if you can help it. Here be dragons, as the saying goes.

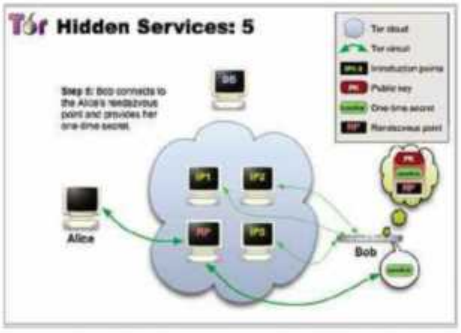
To emphasise the other half of the Dark Web, though, it's worth repeating that due to its ability to hide users and web servers, there are people out there who are using it to reveal to the world the terrible things that are going on behind the closed borders of some countries. To that end, we applaud

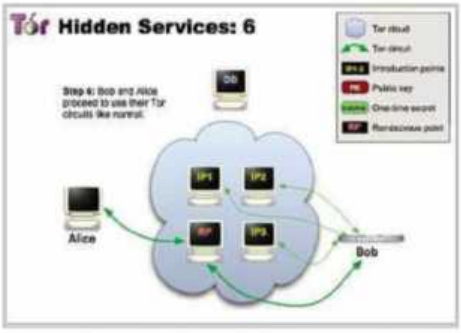


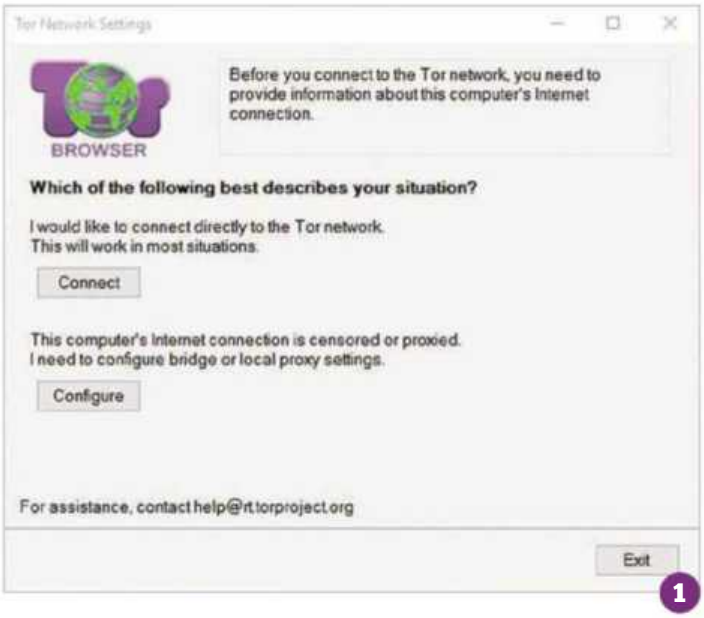












their bravery and the fact they're using a powerful tool to send a message.

What Is Tor?

We briefly touched on what the Tor network is, but to help clarify it better, the following is quoted from the Tor network's overview:

"The Tor network is a group of volunteer-operated servers that allows people to improve their privacy and security on the internet. Tor's users employ this network by connecting through a series of virtual tunnels rather than making a direct connection, thus allowing both organisations and individuals to share information over public networks without compromising their privacy. Along the same line, Tor is an effective censorship circumvention tool, allowing its users to reach otherwise blocked destinations or content. Tor can also be used as a building block for software developers to create new communication tools with built-in privacy features."

With it, you can access other countries that are blocked from the rest of the world – to some degree – or use it to boost your security and privacy online.

As the Tor overview further explains, journalists use it to talk to whistleblowers or to discover a company's illicit dealings. There's even a branch of the US Navy that uses it for intelligence gathering.

Basically, without it, you won't be able to access the Deep Web or anything relating to it. And if you try, you'll be blocked and run the risk of having some very scary individuals dressed in black and brandishing automatic weapons swing in through your bedroom window in the dead of night. So don't even attempt it.

Accessing The Dark Web

You'll need Tor to access the Dark Web, that much we've established. More specifically, though, you'll need to use the Tor Hidden Service Protocol.

The Hidden Service Protocol within the Tor network works by creating links to a hidden server through introduction points, which are computer nodes within the Tor cloud. This introduction then creates a public key, which can let other Tor network users see the server.

The service will then build a Hidden Service Descriptor, which contains the public key and information of each introduction to a distributed hash table.

For a user on the other end of the Tor network, hypothetically speaking, to access the hidden server, they'll need to first know it's friendly, human name, which ends in .onion. And when they enter it into the Tor-enabled browser, they're taken to a Rendezvous Point node that's linked to the introduction points and onto the actual hidden server itself.

Again, there's a lot more going on under the surface. These steps, courtesy of the Tor network page, explain it better then we could.

In short, to get Tor you'll need to head on over to the Tor site at **goo.gl/H8mbEV** and from there click on the link 'Download Tor' from the banner on the main page. The client should be the same as your operating system, Windows, Linux or Mac and so on, and you have a couple of options available as to which type of download you want.

For ease of use, though, you can simply select the Tor Browser for Windows (or whatever OS you use). This will be a 40-50MB file that when installed will allow you to run the Tor Browser, which connects to and uses the Tor onion network.

Step 1

When you first run the newly created Tor browser, you'll get a settings window to help configure your connection. For the most part, if you're at home and you don't have any internet restrictions, you can just click on the Connect button to launch the browser. If you're at work, though, and you have internet restrictions, then you'll need to click the Configure button.

TOR Projects Worth Checking Out

Tor is also involved in a number of other projects:

Orbot: Tor for Android devices.
TAILS: A live Linux-based OS preconfigured for TOR anonymity.
Atlas: A web application for Tor relays.
Stem: A scripting library for applications that can interact with Tor.
Arm: A command line interaction with Tor for monitoring.
OONI: Free software platform for detecting censorship and traffic manipulation over the internet.

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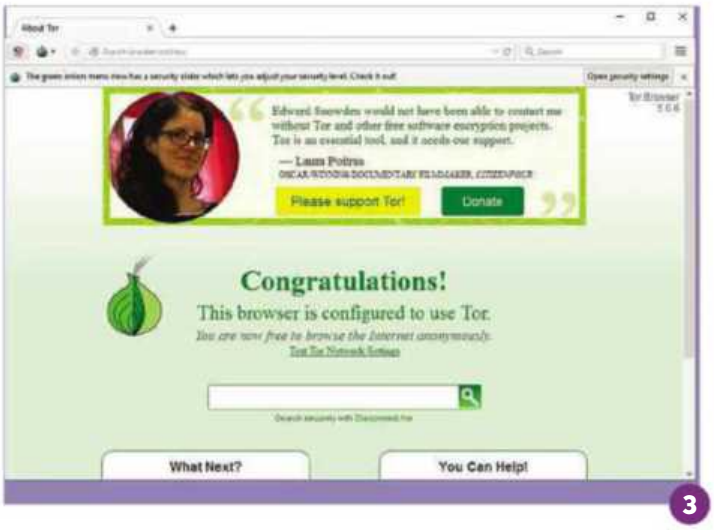

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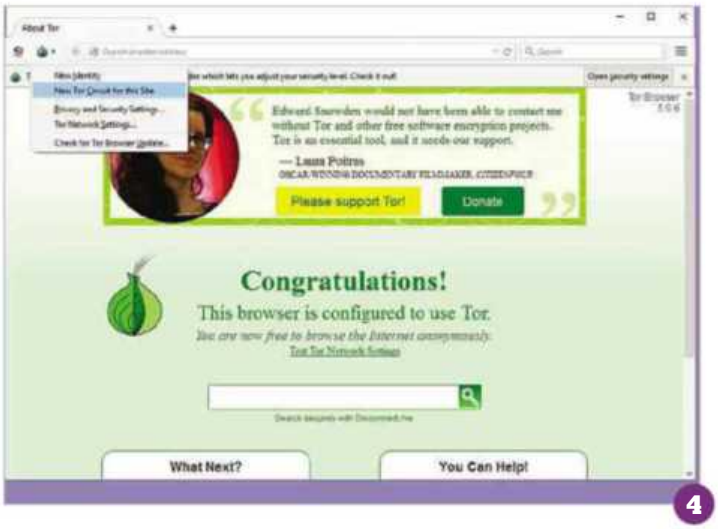

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We can't walk you through this process, as each network is configured differently, and as a warning, if you tamper with your work setup, there's a good chance you could get the sack.

Step 2

After clicking on the Connect button, the Tor browser will connect to the Tor network and set up a secure link to the other nodes.

Step 3

With the tor browser now open you can securely surf the internet and, more to the point, you can start to access the Dark Web.

Step 4

If you're interested in the security of the Tor browser, which is essentially a version of Firefox that's been beefed up with every security precaution possible, you can view the settings by clicking on the onion icon next to the address bar.

Step 5

Now you have Tor installed and you're up and running with it, to access the Dark Web you'll need a starting point.

You won't be able to Google the information, obviously, so you'll need to consult a hidden server directory. There are several available; some are better than others and will provide you with links to .onion hidden servers that the other won't.

Generally speaking you're on your own after that, but to begin with you can look at the following hidden server directories focusing on a range of services. We've decided to leave the actual links out – for good reasons: in case younger and inexperienced readers try to view them.

General hidden search:
Hidden Wiki
TorDir
Not Evil
Torlinks

Financial:
Hidden Wallet
Shadow Wallet
Onion Wallet
EasyCoin

Commercial services
Cstore
Mobile Store
Rent-a-Hacker
Social Hack

The list goes on, and within those categories we've listed are areas to access stolen credit cards, rigged sporting events, hacked PayPal accounts, obtaining fake passports and citizenry documents and so on.

A Final Warning

The Dark Web is the kind of place you'll never really need to enter, unless you're trying to contact someone who is in another country that has some pretty extreme restrictions.

Let's face it, 99% of the Dark Web is, to quote Obi Wan Kenobie, "A wretched hive of scum and villainy". Even those who frequent the Dark Web avoid some of the more dreadful areas of it. There is stuff in there that will make you physically sick, so please tread carefully or even better, leave it well alone. **mm**

5

MAGBOOK

INDEPENDENT AND UNOFFICIAL GUIDE

MINECRAFT SECRETS & CHEATS

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Books, Websites & Apps For Aspiring Coders

If you're trying to get into programming and need a hand, there's plenty of help available if you know where to look

Programming is seen as a very highly specialised job and, to some degree, that's perfectly accurate. To become a professional coder, you're required to take on board a huge amount of knowledge. You're not only learning one or multiple new languages, but also logic, design, planning and much more. It's a complex and varied role, and depending on your sphere of expertise, be it web development, productivity and business applications or games, you'll have to learn totally different skills. There's no such role as a simple programmer in truth, and jobs vary wildly in skill and experience, and budding coders often need to pick an area to focus on, often learning even more skills throughout their career, but what's the best way to begin down this road?

For many, a perfect start lies on their own PC and in their own home, learning the basics and getting a foothold using their own means. Obviously, professional education is by far the best, so attending higher education is always going to be ideal for most, but you don't have to rely solely on this to get started, and for some, there's no need to do so at all, thanks to the internet and other helpful media.

Available online and off, you can find all sorts of learning aids and books that can help any would-be programmer get started. And with a PC connected to the internet, there's very little you can't learn in the comfort of your own home, regardless of the language you choose to focus on.

This week, we'll be looking at these options and we'll cover the home education you can use if you want to teach yourself how to code or simply need some extra instructions to go along with your school work.

What Language?

Your starting point for any programming journey is going to be picking which language you're going to learn, and this is a question that could take a long time to answer. Many factors will govern the language you pick, including the kinds of program you want to work on, the platform you wish to develop for and the industry you wish to get into. There are so many languages and natural crossovers that it's likely you'll end up learning many different languages. Few programmers learn only one language ,and although many will specialise in one or maybe two, most will have decent experience of many, including languages that may lie outside of their chosen field.

Software developers will usually have experience of developing websites, and even game developers will routinely know languages like SQL. Some are simply common knowledge for those involved in coding, not only because it broadens people's skills, but it also helps when looking for jobs, as there are rarely postings for coders that don't involve desired skills that include multiple languages.

There are, of course, staple languages you'll want to learn for certain roles. Database admins, for example, will always need to know SQL, as it's the most common data-handling language used in business. Languages like Visual Basic, Delphi, C#, Java and HTML5 are just a few people use for developing mobile apps and other applications. Arguably the most flexible and desired language, especially for large-scale projects, powerful applications and games is C++. This is seen by many as the ultimate language to master and it can open many doors for the budding coder looking for that dream job.

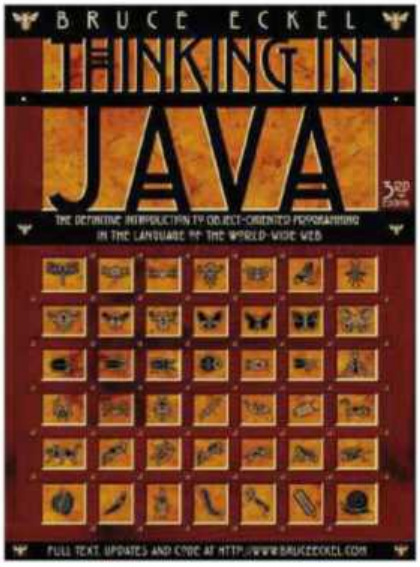
> **“There are, of course, staple languages you'll want to learn for certain roles”**

Of course, all languages are flexible enough to be used in many ways, and C++ isn't the be all and end all. Other languages can be used to program games, for example, and there are many more data-handling languages than SQL. Companies will often have their own preferred set of languages they use for development, which is why it's a good idea to be flexible and learn more than one.

Home Schooling

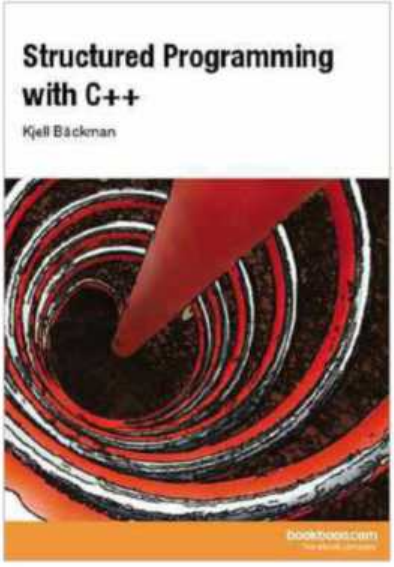
As we've said, there's really no substitute for further education or professional courses when it comes to learning programming languages, but it's nonetheless something you can learn yourself at home. Thanks to the internet, there are many ways to do this, and you can also find a lot of useful books on the subject.

There are countless books available, both electronic or paper, that can teach you various programming languages, and they

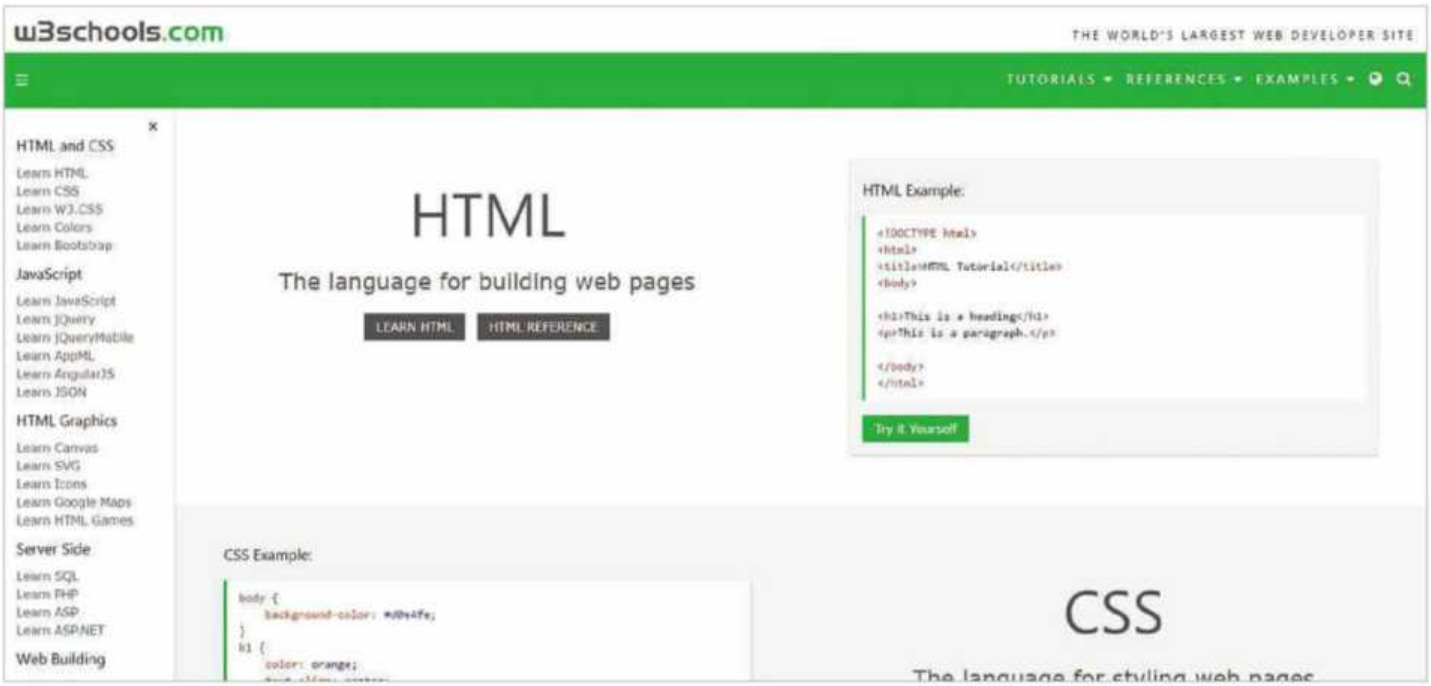


Thinking in Java

Byte of Python is a useful e-book



Structured Programming with C++



W3Schools is a good site for learning online-focused languages

range from total beginner tutorials to reference materials for experienced users who simply need the odd refresher or two. No matter how good you are at programming, you'll always need to look up information from time to time – ask any veteran coder.

One of the best book ranges for newcomers does itself a bit of a disservice with its title and that's the *Dummies* range. These books are often overlooked due to their apparent disdain for the reader. No one likes to be called stupid, after all. Their look also makes them appear less than professional, and many believe they're simply not all that effective. Now, there are a lot of books in this well known series, and we can't comment on them all, but when it comes to programming, it can be a very good range to go for if you want to get started.

> **"Python is another popular language, and it's particularly common as a first-time language for newcomers"**

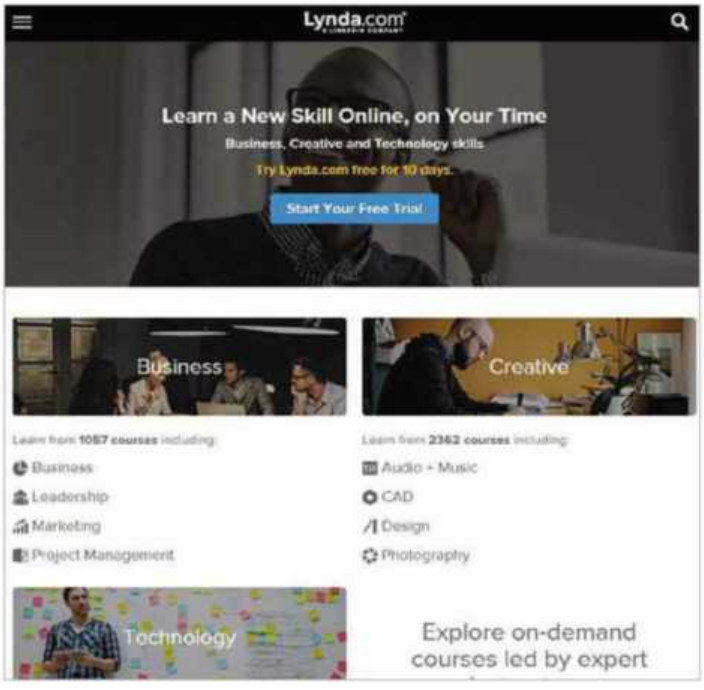
The *Dummies* range covers a wide collection of languages, and it does so with an easy to understand manner that eases users into the subject. It's littered with practical explanations and activities, and contrary to the titles, they're very good at hand holding a newcomer through those early steps.

If you're looking for more in-depth titles, you'll find no shortage of them around, all specialising in different languages and uses. There are far too many languages and books to cover here, of course, but here are just a few you can find, some of them totally free online.

Java is a very popular language for many reasons, and Bruce Eckel's *Thinking in Java* is a great free e-book that'll teach you the ins and outs of it. You can download this from **www.mindview.net/Books/TIJ**. The third edition is the free volume you'll want, and it's very in-depth and informative, with award-winning advice contained within.

Python is another popular language, and it's particularly common as a first-time language for newcomers. It's a great choice for learning the basics of coding, making it an entry-level option. As it's still a new language to learn, however, it can be challenging without the right guidance. Enter *A Byte of Python* by Swaroop CH. This book is aimed at total beginners, not only in terms of coding but computers in general, and it's a good read if you want to get your feet wet with this reptilian code. You can find this e-book at **python.swaroopch.com**.

We've already mentioned that C++ is one of the most powerful and desired languages around, as well as it being one



Lynda.com is one of the most professional tutorial sites around

of the most difficult to master, so learning it is no doubt going to appeal. A good place to start here is Richard L Halterman's *Fundamentals of C++ Programming*. This is a free e-book that covers the basics of C++. It teaches you all you need to know to get a foothold in C++, and it does so in a way that requires no prior knowledge of programming at all. Even readers with no knowledge of coding at all can make use of this book.

> **Many browsers come with built-in developer tools**

A good accompaniment to this would be Kjell Bäckman's *Structured Programming with C++*. As well as teaching C++ coding techniques, which it does well, this book is written to help you think more in terms of programming language and more like a programmer. This is a skill that can be hard to master, as you have to think differently in terms of how things are planned and executed. This book helps with that, and like the Halterman's book, it's also free. The two books are available from various locations online and are just a search away.

119 SQL Code Smells may have a strange title, but it's a great book that can help you learn SQL, as well as functioning as a great reference – something any SQL developer will agree is always useful. With contributions from SQL Server pros, it's made up of, unsurprisingly, 119 'smells', which are basically common SQL problems that people have encountered. This book will tell you how to deal with them. Although it's not an SQL tutorial book per se, SQL is a funny language that's easy to read and understand but hard to master, so this is a valuable aid. You can grab it from **bit.ly/1zrZyvr**.

Because SQL is a very common language desired by many employers, you may be looking to learn the basics in order to give yourself an advantage, and for this, you could read *A Primer on SQL* by Rahul Batra. This has been written to teach users the basics of SQL and requires no prior knowledge of SQL or coding. You can grab this from **leanpub.com/aprimeronsql/read**.

Of course, one of the most important languages any self-respecting coder needs to know or at least have passing experience of is HTML. Still a building block of the internet and a very important skill, HTML is handy for just about anyone getting into the IT industry in whatever capacity. *Sams Teach Yourself HTML in 24 Hours* is, therefore, a very good read. As the title suggests, this book should teach you the basics of HTML in a day, to the point you'll be able to code and upload a fully working basic web page. It's basic, sure, but it's free and does a very good job of getting you started. You can read it at **bit.ly/1XvFoh1**.

Online Academy

Reading books is always going to be a great way to learn new skills, but we also have the internet to help, and it offers an

Learn Online

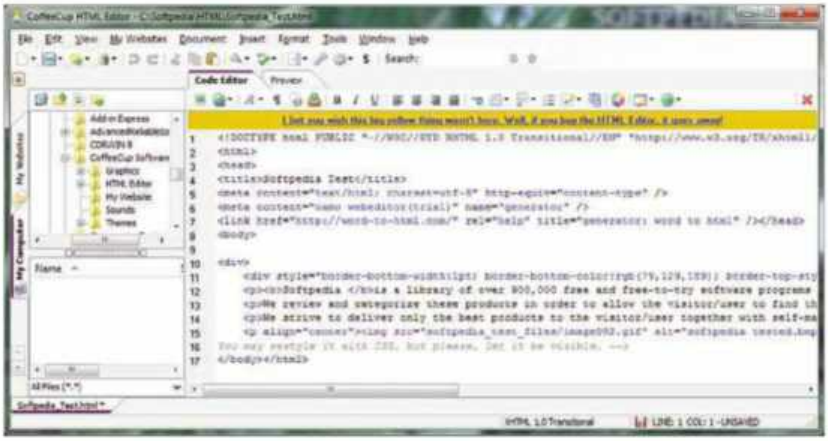
We've looked at various online learning resources, but as well as being a great place to find tutorials, the internet can be so much more in terms of learning how to program. It can be the perfect first step too.

Coding websites using the myriad of languages can be a very easy and cost-free method of getting started. Learning languages like HTML, Java, Flash and so on can teach you valuable skills, and the tools that you need to do so are often free. Many browsers come with built-in developer tools, and dedicated software is freely available and is just a quick search away. It's easy to get your work online, and in no time you can have an active website and can even earn money from your craft quickly.

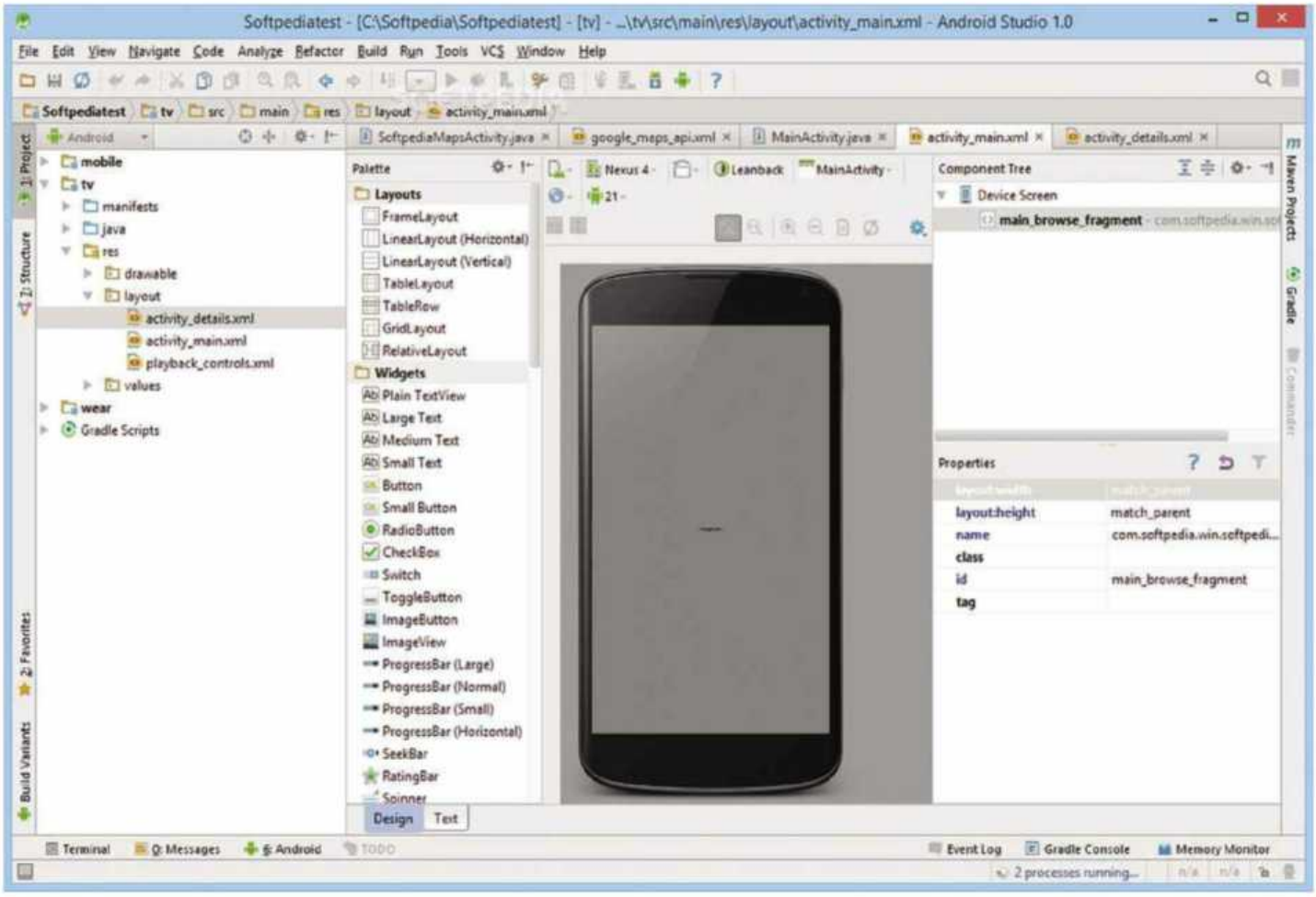
EasyPHP (**www.easyphp.org**) is a free tool for developing PHP projects. PHP is a popular website language and some prefer it over alternatives. This development suite lives up to its name, and it makes developing PHP projects easy, and it combines PHP, MySQL and Apache into a single suite. The whole thing can even run from a USB stick, and it supports add-on modules for Drupal, Joomla, phpBB and WordPress support.

If you want to get to grips with the most basic online language, HTML, then you really should look at CoffeeCup HTML Editor (**www.coffeecup.com**). This is a free HTML editor that has a familiar interface and is very easy to use. As well as being a great tool for beginners, it has plenty of high-end tools for more advanced users, so it'll grow with you as you learn.

EasyPHP is a free PHP development suite that supports a variety of CMS versions



CoffeeCup HTML is a powerful, free HTML studio



▲ *Android Studio is a great development package*

almost never-ending supply of outlets for the acquisition of knowledge, especially when it comes to programming. Unlike books, the internet gives you the chance to interact in such capacities as completing activities, answering questions and even taking exams. The array of practical tests makes getting used to coding much easier, and the instant feedback you can get means you'll always know how well you're doing.

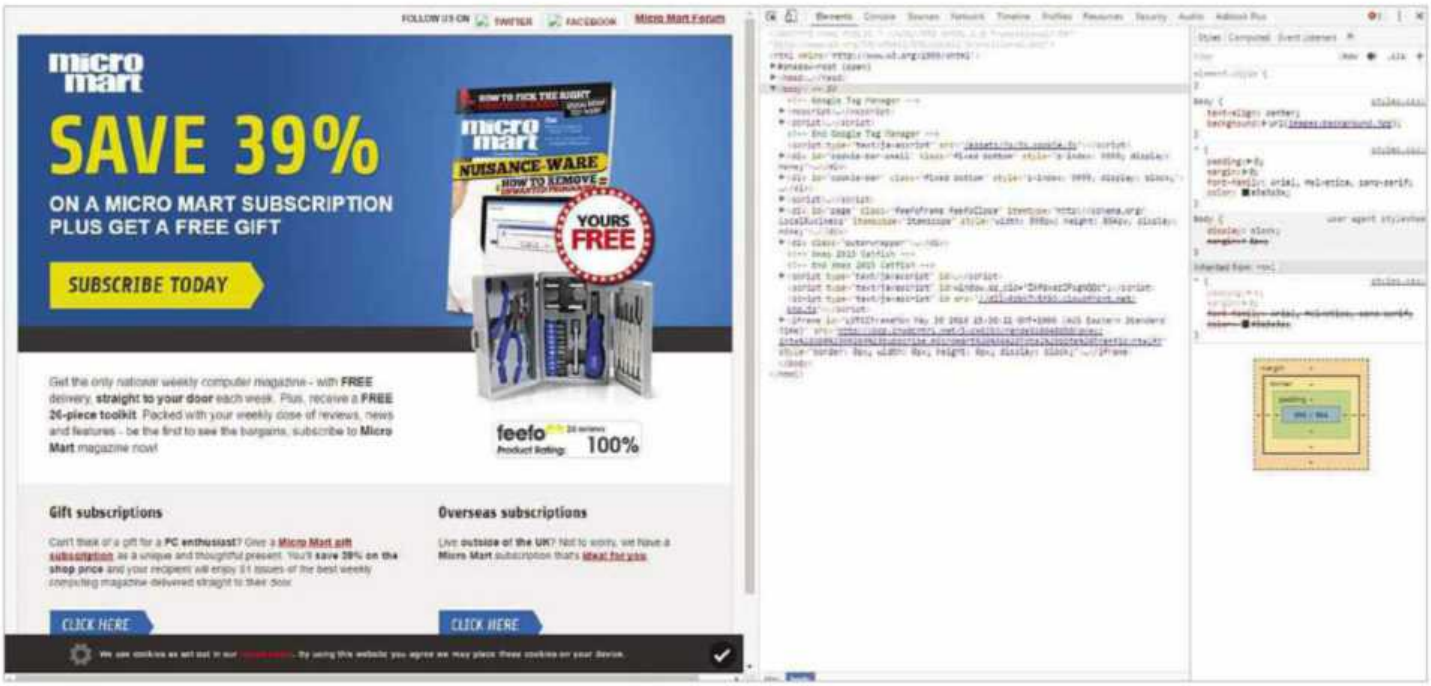
One of the most famous internet sites for this is **www.w3schools.com**. This site has a large selection of tutorials and references for the just about any core web programming language you could ever want to learn, including HTML and CSS, PHP, SQL, ASP, Java and XML. There's in-depth instruction and learning texts, as well as all sorts of practical activities that'll get you coding in no time. It starts with the basics and leads you through more advanced topics, all designed with the user in mind.

Another popular site is Code Academy (**www.codecademy.com**). Focusing on interactive learning, this site requires a registration, but once you do, you'll have access to some very well written and executed tutorials for languages like HTML, SQL, Java, PHP, Python. Ruby and more. There's a collection of testimonials from people who managed to find new careers in programming thanks to the site, so it's worth a look.

Code School (**www.codeschool.com**) features a library of programming tutorials including the basics like HTML, Java, SQL and so on, as well as other sections based on other useful skills like iOS. The site uses a lot of video instruction followed by practical activities, and it can track your progress as you learn, even awarding you course badges. It's aimed at bestowing foundation-level skills in languages, so you can use this as a stepping stone to more specialised knowledge, and it does this well.

Another very popular and well-known teaching site is **www.lynda.com**. This service isn't free, and it does require a fee, but there's a free trial for you to try, to see if you like what it offers. The site offers some of the best online tuition around for a large range of skills including all the usual core languages, as well as directed courses on topics like Android and iOS development,

▲ *Apple's Swift is an easier language to learn than C*



Most browsers, such as Chrome, include developer tools

the increasingly popular game development tool Unity and much more. It's a very professional site and one that has a lot of past success to back it up, which warrants the cost of its use. It's certainly well worth giving the free trial a go.

Learning Apps

The internet does a good job of teaching and even gives some valuable hands-on coding experience via tutorials and examples. However, to really get your head around coding, you'll need proper, practical experience. For this you need an actual application. There are many available, and studios for various programming languages can be downloaded from various sources. Here are a few.

Android Studio (**bit.ly/27YwRIt**) is a free development package for – you guessed it – Android applications. As we mentioned before, programming applications for mobile platforms like mobile phones can be a great place to start, as the languages are often more friendly for new programmers, and it's far easier to get your work published and made available. This studio is a great tool for learning, because it's an all-in-one toolset with an intelligent code editor that features autocomplete – always a great feature for learning. It includes an emulator, so you can run your programs in a virtual Android environment, and it's easy to compile and export your work. Because it's Android, you can also develop for multiple types of platform. There's a template function too, so you can start from preset code snippets, which is another reason it's a good place to start.

Apple's Swift programming language replaced the need to learn objective-C and resulted in a more user friendly language to develop OS X and iOS applications. To get your start with it, you need to download Apple's Xcode suite (**developer.apple.com/xcode/download**). This gives you everything you need to code Apple-based apps and includes the Xcode IDE, Swift 2 compiler, platform emulation and SDKs for OS X, iOS, tvOS and even WatchOS. It has everything you need to develop apps and, like the Android studio, it's a great option to begin with, because you won't have to be concerned with platform differences, OS versions and the other hazards that come from other languages.

Of course, you may want to get started with languages that a lot of companies look for when employing for open positions, and this can often mean Microsoft skills. Visual Basic, .Net, SQL and so on are all desirable skills employers look for, so getting experience with them is definitely advantageous. You should certainly have a look at Microsoft's free Visual Studio Community (**bit.ly/1BOHNbo**). This is a free development studio that includes a huge amount of flexibility, and it also includes the tools needed to develop for Windows phones. There's a superb coding interface, intelligent editing, full debugging tools, web integration and much more. There's support for multiple languages too, including C#, C++, Visual Basic, F#, JavaScript, TypeScript, Python, SQL and others. It's powerful, and for some it may actually be a little too much, but if you're looking for a free and great place to start mainstream coding, this is a perfect choice, just make sure you have plenty of learning materials to go along with it.

It Takes Time

There are clearly more tools and plenty of available help available for those wishing to learn how to program, more so than there's ever been, thanks to the internet, but there's one skill no one can really teach and that's patience. If you decide to get started in programming, even the best books, apps or tutorials will be useless unless you have the patience to take it all in. Learning programming is difficult and it takes a lot of time, trial and error and importantly, a lot of mistakes. You need to be willing to put in a lot of time and effort to get to grips with any language, even the most basic, and you'll run into a lot of problems, errors and failures along the way, even with good learning material. It's all about attention to detail and the ability to read and reread your code to worm out the smallest typo, code mistake or broken loop. With time, it'll all fall into place, and the various methods of tutelage we've listed here will be of great help. **mm**

Has E-sport Just Got Serious?

Competitive gaming now has a governing body to help 'professionalise' the industry. Mark Oakley wonders what it is going to change

August 2015: across six days of competition, thousands in attendence – and millions of viewers around the world – watch people play video games in the Key Arena, Seattle. In what is described as the highest-profile e-sports event ever held – Valve's annual *Dota 2* tournament, known as 'The International' – 16-year-old Syed Sumail Hassan becomes the youngest ever e-sports millionaire as his team win the final and grab its chunk of the $18m prize fund, taking his tournament earnings above the $1m mark.

Flash forward just eight months to April 2016: Korean authorities arrest eight people as part of an investigation into e-sports match-fixing allegations relating to professional competition. Among those arrested is Lee Seung Hyun, a former *StarCraft* world champion and genuine star of the scene, who is accused of throwing a couple of competitive matches and pocketing around $60,000 for his trouble.

The two cases serve to highlight how much money is now involved in competitive videogaming, an industry that has grown significantly since the creation of the Electronic Sports League and the Major League Gaming organisation in the early part of the new millennium.

The rapid rise of e-sports has also created a rather sprawling, unstructured beast. Different organisations run separate leagues with varying rules and regulations for each. Within those leagues themselves the rules are not standardised and even within teams gamers are dealt with differently to each other. For such a big-money industry, it all seems a bit over-complicated.

Enter the World eSports Association.

WESA? What's That?

The World eSports Association (WESA) is a new regulatory body that is looking to further professionalise e-sports. Co-founded by the Electronic Sports League (ESL) and a select group of professional e-sports teams, WESA has been created in recognition of the lack of structure in professional gaming. In an official statement by the ESL, WESA is described as offering "the chance to bring all e-sports stakeholders – players, teams, organisers and broadcasters – to the discussion table in order to bring much needed structure, predictable schedules and transparency to the scene".

> **"WESA has been created to address the perceived lack of structure in professional gaming"**

Key to its structure, and a major selling point as hammered home by the ESL, is that WESA's members include professional gamers themselves with "eight of the world's biggest multi-gaming brands" having contributed to its formation, both in terms of expertise and financial input. The eight teams involved in WESA are all well-known members of the ESL's Counter-Strike Go Pro League.

As part of WESA's creation, an operative Player Council has also been established, elected by WESA's gamers, which will "represent, strengthen and advocate on behalf of pro gamers on a number of important topics, such as league policies, rulesets, player transfers and more". Having gamers become part of the decision process and actively involving them by having them part-fund the body itself is viewed by the ESL as a positive thing, because these are the chaps on the ground who really understand how the system works. They know what pro-gamers want from events and they should be able to act as a players' union, similar in essence to something like the Professional Footballers' Association.

One of the gamers signing up to WESA, Wiktor 'TaZ' Wojtas, said, "For the first time in the history of e-sports, players will come together to organise themselves, and that will enable all of us to get a real say in decisions that directly influence us. With a Player Council sitting at the table with the rest of the decision makers, we're going to continue to improve the tournament and league organisation."

It all sounds so positive. So why has one of the founding teams decided to back out already?

All In It Together

Gaming clan FaZe was proudly touted by the ESL as one of the eight co-founding teams behind WESA, but within days of the announcement it was reported that the clan was prepared to pay $50,000 in order to release itself from the body, apparently unhappy at the ESL's demands for clans to sign exclusively with WESA. Press reports surrounding this seem highly embarrassing, particularly since the organisation has only just been formed.

Then the clan released an official statement confirming its departure but denying any penalty having been paid relating to its decision. While the statement found on its Facebook page was fairly tame stuff, explaining that WESA still has lots of challenges to overcome and that the team just felt that it wasn't the best place for it to be right now, media reports quoted the clan as stating that a "lack of transparency" in the organisation ultimately led to its decision to get out. ESPN reported that the team had raised concerns about WESA prior to its press conference launch and that, because this conference was the first external communication it has seen from WESA, it was a concern. In a rather cutting sentence, ESPN also reported FaZe as having said that WESA "doesn't lack big metaphors of what it could be."

The news has added to the many questions now being asked about WESA's creation. The ESL is just one network within e-sports, albeit a very significant one. Other organisations such as Major League Gaming and Gfinity are not involved with WESA at all. Head of partner relations at Gfinity, Martin Wyatt, tweeted on the day of the announcement, "Just to clarify that at no point were we at @Gfinity approached or included in any conversations around the formation of WESA". By leaving out those key organisations huge sections of the e-sports scene have been left out, giving the impression that this is some sort of exclusive club biased in favour of the ESL.

In some respects, this isn't helped by the fact that just eight (well, now seven) pro-teams are involved in WESA's setup, which rather neglects many other pro-teams who might reasonably worry that they too have been snubbed in favour of the selected few. That those teams are also co-funding the body doesn't help matters much, again raising eyebrows as to what level of influence those gamers are going to have on WESA-sanctioned tournaments. Will they be able to have any say on who can and cannot compete in Counter-Strike Go Pro League tournaments going forward? Will they have any say in how the rules can be altered in tournaments? Will they really be representing the gamers within the industry or just looking after themselves in order to better their own positions and boost their gaming income?

Perhaps before the high-profile problems at football's governing body, FIFA, gamers may have been less cynical about such things. The landscape has now changed, though. If a regulatory body wants to be seen as being honest and just then it needs to be truly independent, and it's easy to see why some would question the validity of WESA when it's part-funded by gamers who can only stand to benefit from steering its decisions in their favour.

Some media reports have suggested that one of the reasons behind FaZe's decision is worries over exclusivity. While there is no suggestion at this stage that WESA is heading towards exclusivity agreements, it's easy to understand why people might worry about the possible future direction the body might take. Comparing it with football again, the inception of the Premier League created a top-tiered system that is so financially in favour of those in the league that it has, many would argue, destroyed the very essence of the once-beautiful game. If the teams within WESA took advantage of their position for their own ends, they would stand to benefit while those teams not invited to join would lose out in comparison. Nobody is saying that this is what is going to happen, but it isn't far-fetched to imagine that pro-gamers outside of WESA might be worrying about just these kinds of divisions.

There is another possible worry for e-sports fans and viewers. It goes back to ESL's announcement of WESA, specifically the part about bringing broadcasters to the discussion table. As it has brought in big revenue streams within football, TV broadcasting of e-sports events represents a major financial opportunity for e-sports teams and the ESL. A move towards subscription-only viewing for WESA-sanctioned events could possibly result from any discussions, because WESA's members would clearly benefit from such a move. This would mean less viewers overall, but if the financing was there then it's a conceivable scenario.

This is all speculation, of course, but then that's the problem you have when a regulatory body doesn't get everyone around the table from the start. That's the problem when a regulatory body doesn't appear to be truly independent. You get a whole lot of speculation.

Is There Anything Good To Say About WESA?

Absolutely. Bear in mind that while the above concerns are valid they are also completely unfounded at this stage. In the end, for those gamers coming under WESA's wing its creation should mean a more standardised environment with a level playing field. That, in theory, means more exciting tournaments and better welfare for all those taking part.

Speaking of the welfare of players the worrying issue of betting and match-fixing sometimes rears its head in e-sports, perhaps because of the current 'wild west' approach to contracts. WESA should help to provide members with the confidence they need to stick with an industry that should reward everyone handsomely. Members ought to receive better pay equality too, so the financial disparities among gamers currently will be lessened – while everyone will essentially make a lot more money from this deal.

Recently, Riot Games threw out Team Impulse for failing to pay its players on time, and the fact it didn't have real contracts with its gamers. Separately, ex-gamers have told stories of bullying and contractual issues, of being paid way below what they should have been and of a general lack of support from their team owners. A recent Reddit post from a former semi-professional *Heroes of the Storm* player was brazenly honest about how awful his treatment was. Pro-gamers deserve pro treatment, and who better to understand their needs than other gamers themselves?

> **“By failing to be independent, WESA will find it difficult to be accepted by other gamers”**

The fact remains that e-sports is an industry in need of regulation – the prize money is too big not to have some form of unified regulatory body in charge. Nobody is arguing against that. The problem is that since its announcement there have been plenty of voices questioning whether WESA is that body. It doesn't represent all leagues and organisations, it doesn't represent all gamers and so, while the involvement of pro gamers should be seen as a positive, the worry is that it is doing little more than creating an elite organisation that will benefit its members and little else.

In truth, since its announcement we have actually heard very little about what WESA is actually going to achieve. There have been no follow-up announcements concerning how it's going to work on maintaining the integrity of professional gaming or any specifics on how it's going to better represent its gamers.

The bottom line is that by failing to be independent, WESA will find it difficult to be accepted by other gamers within the e-sports industry. Its scope appears to be too narrow, because it hasn't involved key organisations within the industry. E-sports wants a regulatory body, but is WESA the best it can do? **mm**

Stick To The Script (Or Rather, Don't)

Because e-sport is such a fractured beast, with many different leagues covering various games, there are specific rules covering each game. One general rule to be careful of, however, is the use of illegal scripts. In ESL's primary e-sports title *Counter Strike: Global Offensive*, for example, all scripts are illegal apart from buy, toggle and demo scripts, while *League of Legends* also takes a dim view of scripts, hacks and unauthorised third party programs.

Alphabet Pi: O

David Briddock meanders through Raspberry Pi technology from A to Z

THIS WEEK: Open Source, OpenELEC and OwnCloud

Open Source

The Raspberry Pi Foundation is a huge fan of the open source movement. In fact, if it wasn't for the tens of thousands of people who've freely given their time and expertise, the Raspberry Pi as we know it today simply wouldn't exist.

Consequently, the foundation not only supports the open-source community but gives something back in the way of hardware and software contributions. Many of these are posted on the GitHub website (**github.com/raspberrypi**) and include the Raspberry Pi hardware schematics, various low-level operating system code, NOOBS installer, the Hardware Attached on Top (HAT) specification, plus code examples in Python and Scratch.

The open-source theme also extends to a variety of educational initiatives, which the foundation is heavily involved with on an ongoing basis. The primary focus is UK schools plus the UK computing and science curriculum, but the same material can benefit teachers and students around the world.

> **"OpenELEC is a tiny distribution image, not much more than 100MB in size"**

Even so, there are some outstanding issues. Currently the Raspberry Pi doesn't meet the fully open standards of the Free Software Foundation (**fsf.org**), largely due to the proprietary ARM processor elements within the Broadcom system-on-a-chip design.

OpenELEC

OpenELEC (**openelec.tv**) is an embedded operating system built specifically to run XBMC, the open-source entertainment media hub (**xbmc.org**). After a straightforward installation process, it delivers a TV-like navigation interface experience straight out of the box, and there are none of the configuration and management activities you'd normally expect to undertake with a full operating system.

OpenELEC is a tiny distribution image, not much more than 100MB in size, including the Linux OS, XBMC software, Python language and all associated services and tools. The Raspberry Pi optimised version is even smaller and offers exceptionally fast boot times, along with responsive video performance.

▲ *OpenELEC*

Some of the more advanced features of this media player include support for LiveTV and Airplay plus a music and audiobook integration. It can be installed from the openELEC download page (**openelec.tv/get-openelec**) or via the official NOOBS installer (**goo.gl/sAV6PY**).

OwnCloud

Many of us use cloud-based data repositories like Dropbox, Google Drive, Apple's iCloud and Microsoft's OneDrive, and they're extremely useful, but how about a having a similar repository on your Raspberry Pi?

The OwnCloud server (**owncloud.org**) installs directly on your Pi. It allows you to store documents, contacts, calendars, photo galleries, music, videos and much more. Everything can be in one single folder or sorted into a collection of named folders.

Just like a cloud repository, you can store and retrieve OwnCloud files from any networked device including PCs, tablets and smartphones using a web client or mobile app, and each file is automatically synchronised to ensure you've stored the latest version.

Importantly, with OwnCloud you're in full control of access and security. If you prefer, everything can remain private. Alternatively, you can decide to share your data with others by giving them access to your calendar, photos, music and whatever else you've stored. You can also set up password control and define sharing time limits.

The functionality of the OwnCloud software can be enhanced by downloading pre-built plug-in apps (**apps.owncloud.com**), and a simple development API encourages anyone to develop their own apps. **mm**

Protect Your Android Phone From Malware

Security software for Windows is now on Android, but which apps are best, and what are the risks? Roland Waddilove investigates

Is your Android phone or tablet at risk from malware? There are frequently reports of viruses, trojans, spyware and other security flaws in Android, but just how bad is the situation really? If you're worried about the security of your Android device, there are a wide range of apps that aim to protect you from the ever increasing variety of malware that is spreading around the world.

There are many new players in the market, but familiar companies from the Windows PC security scene are also getting into mobile security. This is because headlines about the latest Android malware to hit mobile phone users are common, and rarely a month goes by without a news story breaking. It seems that security software is needed.

Android might appear to be as riddled with malware as Windows, but the reality is a bit different to the headlines that are designed to grab readers and attract web page clicks. Many Android phone and tablet users have never seen a virus, trojan or other malware on their devices. This is not to say that it does not exist – it does – but a lot depends on your device configuration and where you get your apps from.

Most Android malware exists outside of the Google Play store. If you only ever install apps from the official source, then you're not likely to encounter any malicious apps or spyware. This doesn't mean it's impossible and that you don't need to be wary of what you install.

> **"If you're worried about the security of your Android device, there are a wide range of apps that aim to protect you"**

There have been cases of malware getting into the store in the past. Malicious apps were not there long, and they were removed soon after they became known, but this did not prevent them from being downloaded by many users. Just as with Windows, 99% of apps are safe, but it's the 1% of bad ones you have to worry about. If you're among the first to try a new app, you could discover that it's malware. Don't rush to install newly released apps. Wait to see if problems are reported.

It's possible to configure Android phones and tablets within Settings to load apps from other sources, and there are several alternative stores and websites around the world that distribute apps. These are the most likely places that malware is found. The apps are not tested as thoroughly as those in the official Play store, and bad apps are often found in circulation. Avoid alternative sources of apps, and stick to the Play store, and you'll avoid most Android malware.

Types Of Android Malware

A malicious app is one type of malware, and with the right permissions, it could access any part of the phone, such as text messages, calls, websites and services, contacts, personal information and accounts. The problem is that no one ever bothers to read the permissions of an app when it's installing.

Prior to Android 6, an app would present a permissions list, but your only option was to accept them all or not install the app. Most people would ignore the permissions and install the app, which gave apps unrestricted access to features and information that could then be used or shared. The situation has improved slightly since Android 6, and you can now check app permissions at any time and enable or disable access to features and functions. How many people do this, though? Most people install an app and then use it without bothering to check permissions, let alone revoke them.

There are fake apps in alternative app stores. They pretend to be well-known apps like Facebook and others, but they're either outright malware or they provide the real app but also install malware at the same time. Many paid apps appear to be free, but some cracked apps harbour malware, and you won't realise until it's too late and it's installed on your phone or tablet. Steer clear of these alternative apps stores and websites.

Text messages on your phone can contain links to websites, and these could then infect your device with malware. Beware of links in texts unless you're absolutely sure they're safe. You might see a text claiming there's a problem with a website or service you use, such as your bank, PayPal, Google account, email and so on. They might ask you to tap the link and log into your account. It's an old phishing scam that originated on the PC, and now it's being exploited on mobile phones.

Tapping a link in a text message could display a page that looks like a genuine message. For example, it might show a fake Android update screen, an app update screen or something similar. It looks real, so you tap the button or link to continue, and that gives the malware permission to install. Never tap links in text messages.

From Windows To Android

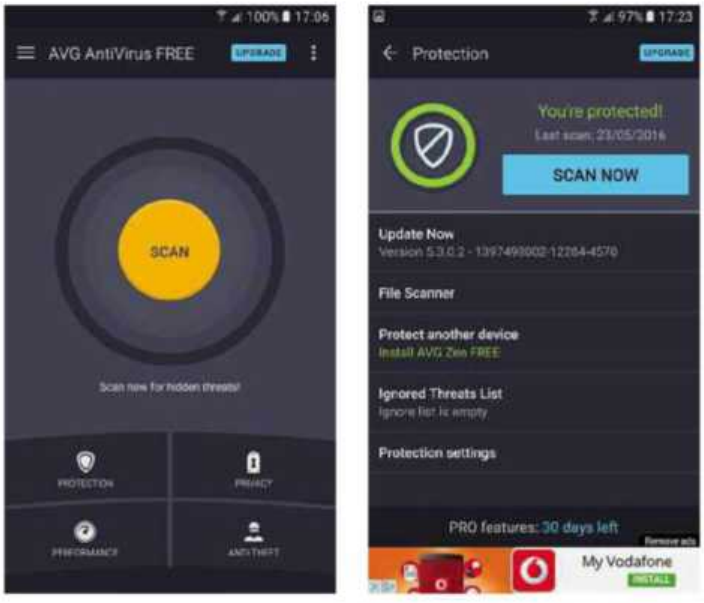
Although there are some new developers of security software for Android phones and tablets, many companies experienced with Windows security software have turned their attention to Android, so names you're familiar with on PC are also on Android.

AVG, Norton, Avast, Kaspersky, Avira and others will all be familiar to you from their PC security software. All these companies have Android security apps, and the good news is that many of them are free. Let's take a look at these apps and see what they offer for Android users. They can all be found in the Google Play store.

AVG AntiVirus Free for Android

Rating: 7

AVG is one of the most popular of the free security programs for Windows, and many people use it to protect their PC. The Android



AVG AntiVirus is simple and effective. It scans quickly, but others have more features

Avast has the usual app scanner, but also a wi-fi scanner too

version is also free and is supported by adverts in the app. However, you can pay to upgrade to an ad-free version.

The home screen has a large scan button in the centre, and a scan seems to take no more than 30 seconds, which is quick. A daily or weekly scan of the Android device can be scheduled, with three levels of scanning sensitivity: Low, High (the default) and Extra Sensitive. In addition to checking for bad apps, Safe Web Surfing checks website URLs, and you'll be prevented from going to known bad sites. This only works with Chrome, not other browsers you might install.

> **Most Android malware exists outside of the Google Play store**

There are a number of other features, such as a call blocker. Your phone should be able to block numbers anyway, but if it doesn't, then you can do it in AVG. There's an anti-theft feature that enables the location of a lost phone to be shown on a Google Map. It's then possible to remotely lock it, display a message to the finder or thief, then remotely wipe it, and it can email a photo of anyone who tries to enter the device password and gets it wrong three times. A task killer enables you to close apps in the background, and there's a power saving mode when the battery level is critical.

AVG AntiVirus Free for Android works well and should provide good protection. It either does not check the permissions of apps or does not report them, so although it might detect malware if you tried to install it, it might not detect possible security flaws from apps with too many permissions.

Avast Mobile security
Rating: 8

Avast is a major player in the Windows PC security market, and millions of people run the company's anti-virus and internet security products. You can run Avast on your Android phone and tablet too, and just as there's a free PC version, there's a free Android version. Like other free apps, there are ads and suggestions to install more Avast apps.

Five icons across the top of the screen provide access to the various parts of the app. The first two just promote other Avast apps, but the middle one is used for the home screen. It displays the current status and a green tick, and 'You are safe' confirms that your phone or tablet is fine. Scanning the device is fast, taking around 30 seconds to complete.

The fourth icon is for checking the wi-fi network. It examines the router password, security settings, encryption, vulnerabilities and so on, and if there are any problems, then it will display them with suggested fixes, like installing Avast's VPN if you're at a public wi-fi hotspot, turning on wi-fi encryption with a password if you're at home. The app displayed very good instructions for doing this, with a variety of popular routers.

The final icon at the top of the screen provides access to a collection of tools. Apps can be locked with a PIN to prevent anyone from using them, and there's a call blocker and a firewall, although that requires a rooted device. The privacy advisor lists all the apps installed, and you can select an app and see the permissions and ad networks it uses. Sometimes the information is very useful and you can see exactly what an app is doing, but other times it displays nothing.

Kaspersky Internet Security
Rating: 9 (paid version)

Everyone is familiar with Kaspersky's security software, and it regularly does well in anti-virus protection tests. If you use the desktop software, you might want to match it with security software on your mobile or tablet too.

Kaspersky Internet Security for Android can operate in free and premium modes. There's just one app, and you can try all the features for 30 days, after which the premium features are disabled, and you can continue with the free features. The free version offers less than some free security apps, but the premium version offers more features for £9.99 a year.

The home screen has a large shield with a green tick if everything is okay, and down at the bottom is a button to scan for malware. Unlike some rivals, there are several options. There are quick scan, full scan and folder scan options. A full scan of everything

Kaspersky's security app has lots of features, but you have to pay for most of them

Despite a few minor niggles with Avira, it is a great free security app for Android

everywhere took less than four minutes, and a quick scan of apps took around one minute. That is longer than AVG and Avira, but it's still fast compared to scanning a PC.

Real-time protection is a premium feature, and this scans apps as you download them. You can always manually scan using the free version before running a new app for the first time. Web protection, anti-phishing in text messages and privacy protection are all available to premium users, but not in the free version of the app. Anti-theft is free, so if your phone is lost or stolen, you can go online and find where it is, remotely lock it and so on.

Kaspersky Internet Security has a great range of features and more configuration options than others. It even supports Android Wear, so you can say to your smartwatch 'Scan', 'Update' or 'Find' in your best James Bond voice. The best features of this app require an annual £9.99 fee.

Avira Antivirus Security

Rating: 9

Avira provides free and paid security software for Windows PCs and also for Android. The Avira Antivirus Security app works in free mode initially, but you can upgrade to the Pro version with extra features by paying £6.99 a year. That works out as 58p a month, which is nothing for security for your Android phone or tablet.

The free app is surprisingly full featured, with hardly anything left out. The scanner is quick and took under a minute to complete. There are options to scan for adware, potentially unwanted applications and riskware. Riskware refers to apps that are not necessarily bad themselves, but which reduce the security or privacy of the device. Automatic scans can be scheduled to take place on any or all days of the week at a time of your choosing.

Anti-theft is available, and it works in the usual way. You can track your device and see where in the world it is, and remotely lock it or wipe it. Avira SafeSearch uses Chrome, but searches are performed at **search.avira.net**. This enables the results to have a green badge to show that they're safe. Identity Safeguard can monitor your email and contacts to see if they've been hacked, and Blacklist can block any contact.

The Privacy Advisor is disappointing. It lists apps according to their permissions without regard to whether they are safe or not. Most apps are listed as high risk, even LastPass, PayPal, Google Docs, Calendar and Photos, and many others. It's then left to you to decide whether to mark them as trustworthy.

Avira Antivirus Security is an excellent free app for your Android phone or tablet. Paying gets you more frequent updates, secure web browsing and more frequent updates, but the free version is probably sufficient for most people.

Norton Security and Antivirus

Rating: 9 (paid version)

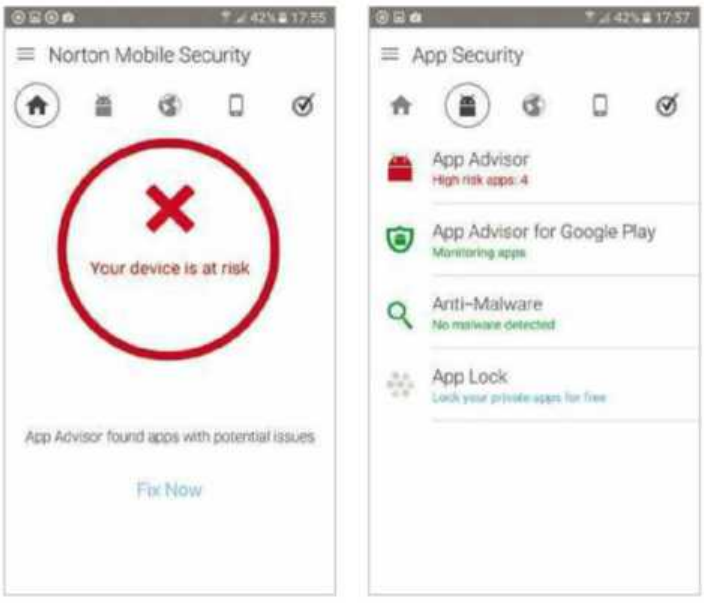
Many Windows users trust the security of their computer to Norton, and the company is one of the oldest in the security market. The Android app is free, although there are premium features. However, there are some very good deals to be had on the Norton website (**uk.norton.com**). For example, Norton Security Deluxe for five devices is £29.99, and this means any combination of Windows PCs, Apple Macs, and Android phones and tablets. That is a bargain and is worth considering when you're next renewing your security software.

The Android app scans the system quickly. In our test, it finished in under a minute like the others. It was disappointing to see that it found problems. The App Advisor found four high risk apps, but when they were listed, they were only Spotify, BBC Media Player, Starbucks and a Microsoft app. Medium risk apps included LastPass, Google Docs, Sheets, Photos and others. There are options to set them as trusted or to uninstall them. It's a bit pointless labelling well-known apps as risky, and it just spreads fear and doubt.

The best feature, and one that no other security app has, is the App Advisor for Google Play. As you browse apps on the Google Play store, a message is displayed at the bottom of the screen indicating whether it's risky. Nearly every time it said no risk, but occasionally it said no information. No risky apps were found, but with a million apps in the store, there may by some.

Web protection is provided, which stops Chrome going to known fraudulent websites. There's also the usual anti-theft feature that remotely tracks your phone and enables you to wipe or lock it, and there's call blocking and contacts backup.

Safe Web Filtering and App Advisor are premium features that stop working after 30 days unless you subscribe for £14.99 a year. It would be better to get the five-device protection deal from the Norton website, though. **mm**



Norton is best when purchased as part of a five-device security package

Nvidia GeForce GTX 1080, Now At Overclockers

Over 70 New Emojis Coming This Month

Unicode 9.0 introduces bacon, avocado and green salad. Yum

Everyone loves a good emoji, right? Right! As such the news that we are going to be offered many more of them by the end of the month should be greeted with universal excitement. Yes, the Unicode Consortium has accepted no fewer than 72 new emoji characters as candidates for the Unicode 9.0 release, planned for June 21sr.

The new emojis accepted by the Consortium include: avocado, bacon, boxing glove, croissant, pancakes, baguette and many more breakfast food items. We're most intrigued by the inclusion of the very specific face palm, water polo, and green salad, truth be told. Just imagine, if you are time-poor and you really, really need to text someone about your desperate need to eat a bacon and avocado baguette before playing some water polo, now you can do so with just a few emojis. Yay!

Three Wants Spectrum Protection

Calls on Ofcom to keep an eye on rivals

Mobile operator Three has asked communications watchdog Ofcom to bear it in mind when the next spectrum auction comes around. Said auction should be happening by the end of the year, and Three is looking for some protection from the might of BT and Vodafone with the *Financial Times* reporting Three's head as saying that BT and EE currently have nearly half of the spectrum UK carriers need to operate in. With Vodafone also having 28% of the spectrum, Three wants to make sure that it doesn't miss out and so is asking Ofcom to limit the amount of spectrum BT can have.

With Ofcom having rejected the merger of Three with O2, the mobile operator wants to ensure competition is retained, which is fair enough really. For us good old consumers, let's just hope that competition keeps prices down.

QUICK BITS... **Minecraft has sold over 100,000,000 copies to date. Impressive**

Three times performance boost

Overclockers UK has contacted us to let you all know that it's now selling the Nvidia GeForce GTX 1080 graphics card. So form an orderly queue.

Both the Founders and non-Founders editions of the card are available, and the hardware promises up to three times the performance of previous-generation cards – plus superior energy efficiency. Overclockers is also keen to point out its collection of Nvidia G-Sync monitors, promising a tear-free experience.

Head for **www.overclockers.co.uk** for more on this.

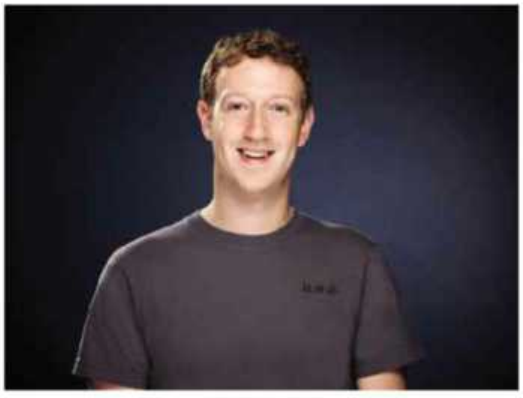
Zuckerberg's Social Media Accounts Hacked

Silly password, Mark

Poor old Mark Zuckerberg. His Twitter and Pinterest accounts were hacked during the first weekend in June, thanks in part to the LinkedIn password breach that revealed his login details – along with the many millions of affected users, of course.

As his social media accounts were hacked it would rather suggest that he may not have protected his own accounts as well as you'd imagine. Indeed, the hacking group OurMine said that they could access Zuckerberg's account because his password was "dadada". Seriously.

Zuckerberg's Facebook account wasn't affected, which would have been a good few levels more embarrassing, and the hacked accounts have since been secured according to a Facebook spokesperson. While this is the kind of news that will raise a smirk or two among those in the know, it serves as a useful reminder that hacking can happen to anyone if security isn't strong enough.



Thanks to digital photography and wi-fi, it's never been easier to set up a security for your home. And best of all, you can access them them wherever you are in the world, assuming they're connected to the internet. it's not just cameras that offer this kind of technology, though. Even locks now have smart features, so you can let people into your house, simply by opening up a mobile app.

This is fantastic, and it's not even necessarily expensive to put such measures in place.

It can be even cheaper, though. If you have an old smartphone lying around, then you have all the technology you need to create a security camera. You just need the right apps and some way to mount it. Unfortunately, it won't unlock your door, though.

Whatever you're looking for, there is some great security technology available. Hopefully, this week's guides can help you to remain even safer in future.

Anthony

Editor

P.S. – You might have noticed that our email servers have been malfuntioning recently. Hopefully, by the time you read this, it will all be fixed, but if not, direct your messages to **micromartmag@gmail.com** instead. Apologies for the inconvenience.

Meanwhile... On The Internet...

It's now been three years since *The Guardian* began to run stories from a then-anonymous source within the US National Security Agency (NSA) delivered to them courtesy of journalist Glenn Greenwald (**tinyurl.com/MMnet18a**). That first story, a revelation that the NSA was routinely collecting massive amounts of data from cellphone company Verizon, was just the beginning of a near-constant stream of highly classified information handed over by the source – who we soon found out was an previously unknown systems analyst called Edward Snowden – to Greenwald and his team, which included filmmaker Laura Poitras, whose documentary *Citizenfour* (the handle Snowden had used in his secretive, encrypted correspondence) would brilliantly document the intial tense meetings with the soon-to-be-fugitive and his press contact in a Hong Kong hotel room (**citizenfourfilm.com**).

Whatever your opinion on Snowden, whether you see him as a hero (**tinyurl.com/MMnet18b**), a legitimate whistleblower (**tinyurl.com/MMnet18c**) or a full-blown traitor (**tinyurl.com/MMnet18d**) for what he did – or agree with the surveillance culture we now live in or not (**tinyurl.com/MMnet18e**) – there's little doubt that his actions have forever changed the way we see the world (**tinyurl.com/MMnet18f**).

On the subject of surveillance, it bears noting that the UK took a major step towards the making the Investigatory Powers Bill (oft-referred to as 'The Snooper's Charter') the law of the land last week. In a surprisingly one-sided vote (444-69: **tinyurl.com/MMnet18g**), Labour MPs backed the bill, having apparently been appeased by the concessions to further oversight (**tinyurl.com/MMnet18h**) eventually offered up by Home Secretary, Theresa May (**tinyurl.com/MMnet18i**), in order to dissipate the potential for a troublesome revolt.

While the concessionary measures don't appear to curtail the Bill's extensive powers very much in reality – the demands for back doors to encryption are less prominent (they were never going to fly in reality, if we're honest), but still haven't necessarily disappeared completely, as the bill still allows for authorities to demand access to such messages under certain circumstances (**tinyurl.com/MMnet18j**) – everyone but the SNP now seems happy to sign it off.

However, with bulk data collection (including all our browsing histories – sleep tight) still at its heart (**tinyurl.com/MMnet18k**), it's pretty certain that the House Of Lords is going to be curious about what's been agreed. Especially in the light of recent leaked reports that seem to imply that the sheer amount of data being scooped up by spies already may actually be hindering their efforts to keep us safe (**tinyurl.com/MMnet18l**).

It's pretty standard, in this day and age, to have a few pictures creep online that would be embarrasing to explain to your boss. Y'know the kind of thing: planking on park benches/statues/car bonnets/friends, that pic of you in full *Gangnam Style* horse-riding pose from new year 2014/15, or maybe the snap of you snoozing away in the sunshine whilst unwhittingly watering the grass with your Pimms? That kind of thing. These are minor embarrassments, though, playful antics – not, we hope, the kind of thing that would probably make you want a massive hole in the world to open up so you could jump in (**tinyurl.com/MMnet18m**).

Nothing like the guy who last week got caught by his boss napping on the job; the man who then had the indignity of having a picture of said boss posing alongside his semi-comatose carcass unceremoniously displayed on the company blog. Not like the man whose boss is one of the most famous entrepreneurs in the world. Not like the guy whose boss is Richard Branson (**tinyurl.com/MMnet18n**), and who inadvertantly became one of the highlights of Virgin main-man's 'Australian Adventure'.

Branson seems to have a decent sense of humour, though, and noted that the poor guy in question was actually on standby, and grabbing some legitimate rest in between flights. He didn't even seemed bothered by the fact the the poor subject of his ribbing totally failed to respond to efforts to wake him. Seems like a good boss to have.

There are bad days at work and *really* bad days at work, though. Falling asleep in front of the boss is one thing, but the FBI coming to knock your door down at 6.30am is something else entirely (**tinyurl.com/MMnet18o**)... but that's exactly what happened to security researcher Justin Shafer, much to the surprise of his wife and young daughter.

The Feds wanted to speak to Shafer about his role in exposing the poor security measures of Dental records software known as Eaglesoft (**patterson.eaglesoft.net**), which had left at database of around 22,000 confidential patient records exposed and accessible from the internet via an unprotected FTP server, an oversight Shaffer had reported to the company and, once sure that the server had been made secure, reported on a blog (**tinyurl.com/MMnet18p**). However, rather than thanking him for his work in helping to keep its customer's sensitive data under wraps, the software creator's parent company allegrs that he broke the law by rooting around on the FTP in the first place (**tinyurl.com/MMnet18q**). They're probably right, too, to be fair – but the decision to call in the police seems to completely overlook the good work that Shafer and others of his ilk are doing as white hats, and may end up backfiring on it.

.AVWhy?

Videos For Your Eyes...
Not Necessarily For Your Brain

You may think you love a particular film. You may well *really* love it... but we'd wager you don't love it as much as Eric Zala, Jayson Lamb, and Chris Strompolos love *Raiders Of The Lost Ark*. Why would we doubt your obsession? Well, we reckon that spending seven years of you adolescent life recreating the movie shot-for-shot goes above and beyond most benchmarks for fandom (**tinyurl.com/MMnet18r**). So amazing is their feat – a 2014 Kickstarter finally allowed the now-adult and not-really-friends-anymore team to recreate the landing strip fight and complete their opus – that a documentary has been made to preserve their amazing journey for the ages (**tinyurl.com/MMnet18s**).

QUICK BITS... Facebook has been actively moving mobile users to its Messenger app. By all accounts, many people

Caption Competition

This rather radical attempt at topiary was the subject of the Caption Competition in *Micro Mart* issue 1416, and here are the our favourite suggestions:

- **ZEDSinBEDA:** "The 'anger management' classes were not going so well."
- **wyliecoyoteuk:** "Now this is what I call an illegal operation!"
- **Sawboman:** "Judy discovered this was not the best way to cut her ex out of a Facebook picture."
- **The VFM Addict:** "Well the Judge said she was entitled to half of all her ex-husband possessed, so why not?"
- **johnbarry:** "That will stop you using it (as much), next time it may be you my dearest."
- **Thomas Turnbull:** "Me and my computer have reached the end of the road we are splitting up."
- **doctoryorkie:** "The new girl cuts her workload in half."
- **ZEDSinBEDA:** "A pay rise would have been simpler."
- **Sawboman:** "Well it did say cut and paste."
- **ZEDSinBEDA:** "I only said, 'I bet you can't cut this apple in half'."
- **Thomas Turnbull:** "I'll give you cutting edge technology... how's this for an upgrade?"

The winner this week, however, is regular contributor **wyliecoyoteuk:** "Sally was a little puzzled, but they definitely said 'split screen display'."

If you have a caption for the picture below, head to the 'Other Stuff' section of our forum (**forum.micromart.co.uk**), or email us your funnies via **caption@micromart.co.uk**, remembering to add the issue number to the email.

Nest Chief Rests

Smart device firm heavily criticised in recent times

Alphabet-owned, smart thermostat makers Nest will have to carry on with a new person at the top, as Tony Fadell has walked away from the company he founded, saying that he had been intending to leave for some time. Media reports, howerver, have suggested rocky times at the company with employees apparently complaining over management and problems surrounding some of its product releases – you may, for example, remember the high-profile issue surrounding the Protect smoke and carbon monoxide alarm that meant waving your hand under it to silence the alarm could also lead to a delay in it working in the event of a real fire? Incidents like that haven't helped make the move under Google's wing the smoothest process.

Amazon Data Centre Outage

Not another one...

Demonstrating the vast amount of problems that can be caused by storing all our data in the cloud, the latest outage at one of Amazon's servers has brought much pain to several Australian businesses.

Amazon Web Services has suffered server problems before, with a big one last year affecting the likes of Netflix and Tinder, and now this latest outage has impacted on businesses Down Under. The server outage appears to have been caused by an almighty storm and among the companies affected were various food and drink outlets, TV and film streaming services and ticket-selling services.

The affected services were reportedly down for around six hours, enough to make for some unwelcome headlines for Amazon's cloud computing unit.

are not happy

Snippets!

Another Social Media Platform For iOS

This one is a little bit different... Stated! is a new social media platform that allows users to create and share favourite quotes using imagery, filters and typefaces of their choice.

A fully-fledged social platform, Stated! features user profiles, hashtags, trending topics, location tagging and one-click integration with all of your major social media platforms – Facebook, Twitter, Instagram and LinkedIn, and the key features include the ability to choose imagery from Camera Roll, image filters, typeface options and one-click sharing. Head to the Apple App Store for this free-to-download, free-to-use app.

Using Apps Saves Time, Apparently

According to a handy slab of research from Speedy Services, we can tell you that being on your phone for hours on end using apps isn't a waste of time after all. In fact, you're actually making time.

In a survey of 2,000 people, over half said that apps did indeed help them save time with over two hours a week saved on average and one-in-ten saying that they saved five hours a week because of apps' help in getting things done.

Apps: they're the future, don't you know.

90% Of IoT Hackable?

Oh dear. Security experts at IOActive have warned that just one in ten Internet of Things devices has adequate security, noting that far too many of them don't come with the requisite security to ensure owners don't become the victim of hack attacks. Nearly half of the security experts surveyed said that less than 10% of IoT devices on the market had adequate security, although two-thirds of those asked conversely felt that security was likely better than on other products. Basically, then, there's a lot to be done to improve device security across the board.

Russia Carries Out Biggest Hacking Arrest

Accused stole £18m

As the world forever spins on its axis, so the hackers will unfortunately continue to rob the world of its riches. However, in Russia, authorities have arrested 50 alleged miscreants accused of using malware to steal over £18m. They used said malware on websites to give them access to victims' PCs, and after that their bank accounts – by stealing login names and passwords.

The hackers were good at their job, it would seem job, and security software didn't find their malware before it was too late to stop them getting away with some spoils. However, those responsible are now thought to be part of Russia's largest ever arrest for such crimes, with raids reportedly taking place in 15 regions across the country.

The arrest saw authorities retain money, computer equipment and various bank cards with false names. Kaspersky Lab helped to uncover the hack attack in the first place, although it would have been better all round if someone had discovered the bad goings on a little earlier.

Another Car Hacked

Mitsubishi affected this time

Here's another hacking story for you to mull over and it's another one involving those huge, potentially dangerous hunks of metal that the BBC's Chris Evans has become synonymous with of late. The affected cars this time round are the Mitsubishi Outlander plug-in hybrid electric vehicle. The security flaw affected the car's anti-theft alarm, specifcally allowing it to be disabled – obviously a bit of a security concern for anyone who owns one of these electric beasts.

The issue was discovered by the research team at Pen Test Partners, which uses penetration testing to find possible vulnerabilities. The team found that it could get past the Outlander's wi-fi security by means of a brute force attack within four days of trying. From there, the researchers found that they could fiddle with the car's lights, air conditioning system and that all-important anti-theft alarm.

Mitsubishi has suggested that Outlander owners disable their wi-fi for the time-being while its engineers speak with PenTestPartners' researchers on how to solve the issue and Pen Test Partners suggest that a medium-term fix (most likely firmware-related) is being worked on.

Mitsubishi hasn't said anything about any recalls at this stage.

QUICK BITS... Uber drivers can now fine passengers who are more than two minutes late

Sims Brings Custom Creation

Gender boundaries torn down by EA

Love it or loathe it, *The Sims* is here to stay. Only this time around, EA is doing things a little differently. For the first time, users can customise their characters' gender, which means that clothing, hair and various other fashion options will no longer be specific to male or female characters.

The change has been brought into play via a game update. In a long post on the matter on its website, EA wrote of exploring "more gender fluidity" than ever before and of making the move because of a "deep respect" for the game's players.

Probably a long overdue update, to be honest.

Cortana Coming To Xbox One

Summer update will bring a bunch of new features to the console

Microsoft has announced that it is releasing a summer update for the Xbox One console that will bring Cortana alongside various improvements to the general interface.

Preview users will get the first look at Cortana, where voice commands will work with both headsets and Kinect. Cortana will be able to be used to find games, see what friends are up to, and carry out common tasks like turning the Xbox One on. To launch the app, users will just have to say "Hey Cortana" to get started.

The update will also bring an new Game Collection interface to make it faster and easier to find games, while the addition of the Facebook Friend Finder and improvements to sharing are signs of Microsoft's wish to focus on the social aspects of the console. So keep an eye out for this over the coming weeks, Xbox One owners.

Sony Launches PS Plus Rewards Programme

Film your best bits to win prizes

PS4 owners will be familiar with that little Share button on the controller that allows you to back up your boasts to friends about your best gaming achievements with cold, hard evidence. Well now, Sony wants PS4 owners to go one step further in their bragging with the launch of #PLUSMOMENTS, a monthly challenge for the PS Plus community that promises prizes galore for the very best videos.

The challenge will focus on three titles every month and for the initiative's launch for June the titles being focused on are *Uncharted 4*, *FIFA 16* and *Call of Duty: Black Ops 3*. All gamers have to do to take part is to upload entries to YouTube by pressing that aforementioned Share button and include the #PLUSMOMENTS hashtag, along with the dedicated challenge hashtag and their PSN ID in the caption.

Entries will be hosted on PlayStation.com and winners will be announced at the end of each month. Overall winners for each title will walk away with a DualShock PS4 controller and a three-month PS Plus subscription. Not bad.

AOC C3583FQ

Curvaceous and colourful – just how we like our monitors

DETAILS
- **Price: ~£500**
- **Manufacturer: AOC**
- **Website: http://goo.gl/n58RCf**
- **Requirements: HDMI, DisplayPort, VGA, compatible AMD card for Freesync over DisplayPort**

We've had a number of great examples of curved monitors through our door in recent months. Both BenQ and Samsung have produced some excellent displays with curved panels, including an array of screen enhancing technologies.

Now it's AOC's turn with the C3583FQ. This is a 35" VA panel with a 160Hz refresh rate, contrast ratio of 2000:1, dynamic contrast ratio of 50,000,000:1, a response time of 4ms and, of course, the icing on the cake, a large screen curve of 2000R.

Connectivity is generous and consists of VGA, DVI, dual HDMI and dual DisplayPorts. Even the 5W speakers are surprisingly good and put the usual 1W or 2W examples to shame. As for ergonomics, the only thing you get is a tilt of -3° to 15°; it's not a huge amount, but it's sufficient for a seated position.

Obviously, the most striking thing is the large curved screen; it will dominate your desk once you've put the monitor in place, and when sitting a couple of feet away, the screen takes up your entire field of vision.

As well as the screen, there are pretty good design decisions. For one, the large flat base, with its curved inward front, features touch-sensitive controls, subtly labelled along one end and above a polished aluminium strip. The base is plastic and quite heavy – more than enough to keep the monitor stable and reduce shaking when typing. It also has a brushed metal look to it, which fits in well with the glossy bezel and the overall design of the monitor.

The AOC C3583FQ is a well designed and beautifully curved monitor

There's ample connectivity and we even like the style

The inputs are lined up at the back of the base, as opposed to them being mounted to the back of the screen. This, we think, is a good design choice on the part of AOC, as it makes everything seem a little neater. Protruding from the base is a thick, polished metal looking plastic arm that connects to the back of the screen – with the inputs, power and audio ports either side of the join to the arm and the base.

Looks aside, the C3583FQ performs well. The flicker-free, anti-glare screen is crystal clear, and with support for AMD FreeSync (with a compatible graphics card), there is no tearing, stutter or lag when gaming of viewing rapidly changing scenes. The colours are bright, and there's a high degree of sharpness to the image that's quite pleasing to the eye.

Naturally, this monitor isn't going to be able to compete with any of the Quantum Dot displays that are currently available, but for a VA panel, it's remarkably good.

The current price of the AOC C3583FQ averages around £500, but we have seen one or two examples that have dropped the price down to a more manageable £420. It's still a lot of money to fork out for a single monitor, admittedly, but considering you're getting an exceptional curved screen, it's not too bad.

mm David Hayward

An excellent curved screen, with a crystal clear display

Arctic P533 Racing Headset

Quality, comfort and price all sound pretty good to us

DETAILS
- Price: £80
- Manufacturer: Arctic
- Website: goo.gl/lacbLV
- Requirements: spare 3.5mm headphone and microphone ports

Getting the right mix of performance, sound quality, comfort and features from a headset is a fine balancing act that's quite difficult to achieve. There are plenty of good headsets available from numerous manufacturers, but it's often hard to find one that's great.

Arctic, though, may have managed to find that perfect balance with its newest stereo gaming headset, the P533 Racing.

The P533 is an over-ear set that features a couple of 40mm neodymium drivers fitted to a cushioned metal headband. The ear cups themselves are equally cushioned, with a thick foam padding and swivel on the frame of the headband to allow for maximum comfort.

The boom microphone also swivels from a vertical position on the left ear cup down in front of the user's mouth, and it has a frequency response of 100Hz to 10KHz. The arm on which the mic is attached can also be moved inward to bring the mic closer to the user, and the mic itself can also be moved in and out to get the right level for the user.

The P533 is comfortable too. Each section can be easily adjusted to fit the wearer perfectly, and on the right ear cup there's a large volume dial that's easy to locate and use.

The comfort of the Arctic P533 is excellent

Sound quality is better than many other headsets available

You could easily wear the P533 for several hours without any discomfort setting in. We managed a two and half hour gaming session followed by a two-hour movie without any problems – not even overheating our ears. That's thanks in part to the lightweight design of the P533, since it only weighs around 370g, but also because of the higher than average quality of the individual components and soft foam covering of both the headband and the ear cups.

In terms of audio quality, the P533 is excellent. It offers a deep bass that's often missing from headsets, and the higher frequencies are perfectly pitched too. Voice in particular is clear and crisp. In fact, the P533 is one of the few headsets with which you can easily pick out individual instruments from an orchestra recording.

The emphasis, though, is on gaming and voice chat within gaming. Thankfully, the P533 doesn't disappoint in this area either. With that great bass level and crisp treble, in-game effects come across well.

In addition to the gaming audio quality, the 1.5 metre cable is boosted with a further two metre extension cable that terminates with the standard 3.5mm headphone and mic double ends – so there's ample room to stretch out on the sofa while enjoying some console gaming.

Usually a headset such as this demands a hefty price, but Arctic has managed to get the P533 out for around £80 which, when compared to other headsets of this quality, isn't too bad at all.

We really liked the Arctic P533 Racing headset. It's comfortable, ergonomic and has excellent audio reproduction. Overall a great headset and one to keep an eye out for come the next audio upgrade.

mm David Hayward

An excellent headset, with superior sound quality

Samsung 750 EVO SSD

Samsung consolidates their SATA SSD range with a new model

DETAILS

- **Street Prices: 120GB (£45.48) 250GB (£68.99) 500GB (123.03)**
- **Manufacturer: Samsung**
- **Website: www.samsung.com/uk**
- **Requirements: SATA-3 port, an SSD friendly OS**

As a rule, the numbering of technology parts goes up, inferring better performance or a higher spec. When it goes down, as it has with the new Samsung 750 EVO, then usually a lowering of expectations is in order.

As I've referred to before, SATA SSDs have run into a cul-de-sac performance wise, as they've hit the ceiling of what bandwidth SATA-3 offers. That leaves price as one of the few differentiating factors that hardware makers can easily adjust.

Those who want ultimate performance are moving from SATA to PCIe NVMe, though the SATA drives remain popular because they're a drop-in replacement for conventional hard drives.

The history of the Samsung 750 EVO part is slightly odd, because it was made available in Japan to system integrators a while back, but initially only in 120GB and 250GB capacities.

Clearly seeing an opportunity, Samsung has now added a 500GB model and pushed it out into the retail market worldwide. Its intention seems to be to replace the 850 EVO while presumably preparing a new high-end offering to eclipse the 850 PRO.

Comparing the specifications of this drive with the 850 EVO makes for interesting reading, because initially they don't seem that different.

They use the MGX controller, have a read speed of 540MB/s and write of 520MB/s, and on the 250GB and 500GB models the IOPS are almost identical.

> **"Performance wise, this drive is exactly where it's supposed to be"**

The differences are mostly to do with the reliability side of this equation, as the 850 EVO had a five-year warranty and was rated for either 75TBW (120/250GB) or 150TBW (500GB/1TB). The 750 EVO is only covered for three years and just 35TBW on the 120GB, 70TBW on the 250GB and 100TBW on the 500GB.

Part of this is to do with the type of NAND used in each case and what sort of usage it can handle. The 850 EVO uses Samsung's 3DV-NAND, whereas the 750 EVO uses planar (2D) TLC flash on the 16nm lithography node – a cheaper process.

There isn't a 1TB or 2TB version of the 750 EVO, but then the 1TB and 2TB 850 EVO weren't part of the same hardware lineage as the other EVOs, as they used a different MEX and MHX controllers.

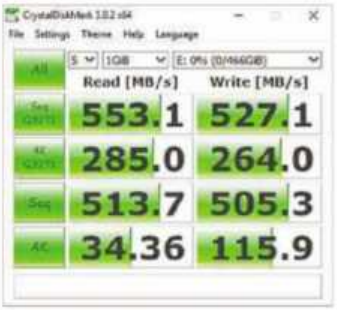
The obvious conclusion is that you're trading long-term reliability for a lower price, but realistically most users would have a hard time hitting the TBW of even the 120GB model within the new shorter warranty period.

In terms of cost per gigabyte, the 120GB is actually the most expensive at about

38p, and it gets better as you move up to 28p for the 250GB and 500GB. For that reason and the lower TBW, I'd probably avoid the 120GB.

What's curious is that if you shop around, these prices are close to what you can get the 850 EVO for, as it's currently discounted by some retailers. Once those prices return to their normal levels, should they do that, then the EVO 750 will be better placed to be the go-to choice for entry-level SSD buyers.

One very desirable feature that it has, which surpasses



both the 850 EVO and 850 PRO, is in respect of power usage. With a maximum consumption of just 2.5 watts and an average of 2.3 watts, the 750 EVO might well be the ideal SSD for use on a laptop system.

Performance wise, this drive is exactly where it's supposed to be, maxing out SATA-3 effectively. Samsung sent me the 500GB model for this review, as it has the best IOPs of each model, though frankly they're peas in a pod as far as sequential read and write are concerned.

For desktop users, I'd recommend you stick with the 850 EVO for now, if only for the longer warranty, though most people would be hard pressed to notice the difference.

mm Mark Pickavance

Samsung 750 EVO Specifications	
Usage	Application client PCs
Capacity	120GB, 250GB, 500GB
Interface	SATA 6Gbps (compatible with SATA 3Gbps and SATA 1.5Gbps)
Form Factor	2.5"
Controller	Samsung MGX controller
NAND	Samsung TLC NAND flash memory
DRAMCache Memory	256MB DDR3 for 120GB and 250GB, 512MB LPDDR3 for 500GB
Performance	Sequential read: Max. 540MB/s Sequential write: Max. 520MB/s
IOPS	4KB random read (QD1): Max. 10,000 IOPS 4KB random write (QD1): Max. 40,000 IOPS 4KB random read (QD32): Max. 94,000 IOPS (120GB) Max. 97,000 IOPS (250GB) Max. 98,000 IOPS (500GB) 4KB random write (QD32): Max. 88,000 IOPS
Data Security	AES 256-bit full disk encryption (FDE)
Weight	45g
Power Consumption	Active read/write (average): Max. 2.3W / 2.5W Idle: 50mW, device sleep (typ.): 5mW
Temperature	Operating:0°C to 70°C Non-Operating: -40°C to 85°C
TBW	120GB: 35 TBW (terabytes written) 250GB: 70 TBW 500GB: 100 TBW
Reliability MTBF	1.5 million hours
Vibration Resistance	Vibration non-operating: 20~2000Hz, 20G Shock non-operating: 1500G , duration 0.5m sec, three axis
Dimensions (LxWxH)	100 x 69.85 x 6.8 (mm)
Warranty	Three years limited

Entry-level SSD with fine overall performance

Zotac Sonix PCIe 480GB SSD

Buckle up, because Zotac just found the loud peddle for PC storage!

DETAILS
- **Price: £295**
- **Manufacturer: Zotac**
- **Website: goo.gl/iYxEMm**
- **Requirements: PCIe slot (4x, 8x or 16x physically, 4x electrically), Windows, Mac OSX or Linux system**

For a long, long time there was only one significant way to connect storage to a PC, and that was SATA. But these days we've got that option plus various M.2 choices, mSATA, SATA Express and PCIe.

I suspect that M.2 will win out ultimately, but in the meantime, if you'd like to have some of the fastest storage around, then Zotac has this Sonix PCIe solution.

From the outside it looks like a video card without a fan or outputs but with a metal case to protect the inner workings. There's a PCIe X4 edge connector and, as you would correctly surmise, it's designed to go in a free PCIe slot.

Zotac also kindly included a low-profile end plate, should you want to put it into a rack system or a media PC with a shrunken case.

There's no power connector, because it draws less than the 7.27 watts this system needs from the slot when writing, and on Windows 10 it doesn't even need an NVMe driver installed.

Once it's in place, you can manage the 480GB of NAND storage on it, as if it was a SATA SSD or a physical hard drive, but this thing goes like the Roadrunner downhill, while making SATA SSDs look utterly pedestrian.

Due to the bandwidth limitations of SATA-3 (6Gbps) the maximum speed of an SSD is about 550MB/s. With PCI Express 3.0 using a 4X connection on Gen 3 mode, the bandwidth on tap is about 8GB/s (not bits, bytes), and Zotac designed the Sonix to exploit a good chunk of that greater capability.

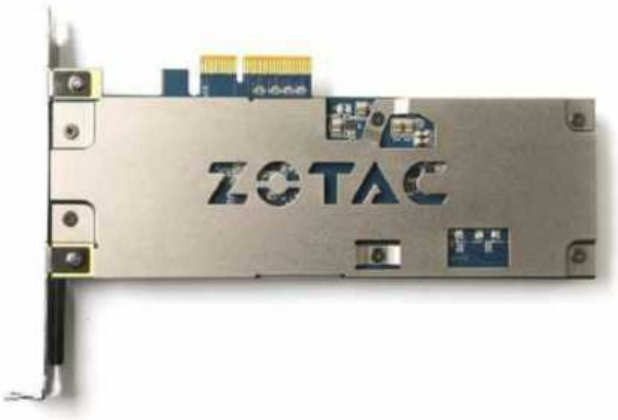
This hardware is built around Phison's PS5007-E7 NVMe controller, driving multi-level cell (MLC) NAND flash memory made by Toshiba, and it threw in 512MB of DDR3 RAM for good measure.

The Phison PS5007-E7 NVMe is very special, with eight channels for interfacing to SLC/MLC/TLC and 3D NAND modules. It can address up to 4TB and has built-in AES-256 encryption.

The Zotac quoted speeds are sequential reads of 2600MB/s, writes of 1300MB/s and random 4K read IOPS of 350k and writes of 250K. In short, if you've never connected six SATA SSDs in a RAID pack, then

> **"You've never seen performance like this... like the Roadrunner downhill"**

Specifications
Form Factor: PCIe add-in-card
Interface: NVME 1.2 PCIe gen 3 and 4
Flash Type: MLC
DRAM Cache: 512MB DDR3
Capacity: 480GB
Sequential Read: Up to 2,600 MB/s
Sequential Write: Up to 1,300 MB/s
Power Consumption: Read: 5.57W, write: 7.27W, idle: 0.5W
MTBF (hours): 2,000,000
Accessories: Bundled low-profile bracket



you've never seen performance like this.

And it's not just paper specifications either, because in my testing, I achieved these numbers and occasionally even more. A staggering 2575MB/s read and 1437MB/s writes, to be accurate.

Most home users won't really care about the IOPS, but anyone running a big database server will be impressed and be budgeting to have this installed at the earliest opportunity.

If you think the jump from spinning iron to SATA SSD was spectacular, then this is an even greater jump in performance from normal SSD technology.

One thing that concerns some people is the lifespan of NAND, and they might worry when they see that this drive is only rated for 3,000 program/ erase cycles and a total of 698 TBW. But that's 3,000 writes of every byte on the drive, and since the controller is designed to wear-level the operations, a typical home user would never actually achieve that much in a typical lifespan (the users, not the device). Even if you wrote 48GB every day, it would still take you 30,000 days (82 years) to hit that level! As most people would write much less than that, the lifespan of this storage should not be a problem.

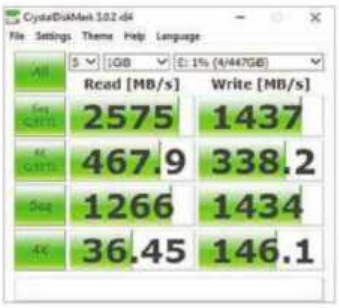
The pricing is also rather steep for those who've seen the cost of SATA SSDs fall dramatically over the past year. A Crucial BX200 480GB is typically about £100, so this is three times the cost, though more than five times the performance at reading and three times at writing.

On that basis, the price is probably where it should be, being £45 cheaper than Kingston's HyperX Predator 480GB Gen2 x4 PCIe HHHL SSD (1400MB/s read, 1000MB/ write).

So what's the catch? There are a couple, even if you are happy to pay the performance premium. The first is that to make all this work as advertised, you need a PCI Express 3.0 slot and sufficient PCIe lanes to make this work without impacting on other devices like the video card. That effectively means Intel X9/X99 or Z170, though you might be able to make it work in other contexts if you don't use a discrete graphics card.

The card will work with PCIe 2.0 (and 1.0), though the results will be capped due to the reduced bandwidths available.

Overall, this is a tough product to fault for those who want the ultimate system.



A 960GB model would be great, but for now the Zotac Sonix is the most desirable SSD around.

mm **Mark Pickavance**

The ultimate in performance PCIe SSD, for now

Parrot Zik 3.0 Wireless Headphones

Parrot launches some of the most desirable wireless cans yet

DETAILS
- **Price: £279.99**
- **Manufacturer: Parrot**
- **Website: www.parrot.co.uk**
- **Requirements: iOS and Android smartphones plus with Android Wear and Apple Watch (Bluetooth 3), PC and Mac on USB, any audio device with 3.5mm jack**

At the very moment I unpacked Parrot's Zik 3.0 wireless headphones, there came the realisation that these were something special, and that's even before I discovered how much they cost!

Everything about them is lovely. From the bone-like elegance of the metal support arms, to the sculpted ear cushions finished in leather. The review models even had a new 'croco' effect leather, if they weren't sumptuous enough already.

They come in black, brown, emerald green or red, in leather-grain, overstitched or 'croc' effect leather, and the overstitching can be in black or ivory.

But I'm being distracted here, because the real purpose of these isn't to impress those with a fetish for beautiful tech, but to deliver high-quality sound.

Technically these are 5.1 capable headphones with a sophisticated adaptive active noise control, designed to eliminate background sound, exactly like that made by the engines of a long haul jet.

Precisely how this works can be either automatic or configured from the associated Zik 3 smartphone (iOS or Android) application. That's useful, because walking about a major city with these on could be very dangerous if you couldn't send the noise cancellation into 'street mode' where you can hear traffic.

The software that controls them is rather impressive and not only allows you to mess with noise control, but also tweak the spatial effects and even build presets for listening to particular music genres or even artists.

The Apple version even works with the Watch, should you be crazy enough to have bought one of those.

One downside to wireless audio is that you normally don't get the best audio experience on Bluetooth 3.0 due to the compression, bitrate and channel limitations of A2DP. Apple helps its corner with AAC over Bluetooth, but Parrot didn't include AptX support, regrettably.

The other wireless caveat is battery life. However, these are the first wireless headphones that have a removable battery, and Parrot does provide reasonably priced spares.

Exactly how long they last is entirely dependent on how you use them and what features are active. The worst case scenario

Specification

Loudspeakers: 40mm neodymium type
Processor: 32-bit processor
Converter: Built-in digital analogue converter 192kHz – 24 bits
Built-in NFC technology: Yes
Frequency range: 20Hz – 22kHz
Touch control panel: Yes
Bluetooth 3.0 profiles supported: AD2P, AVRCP, HFP and PBAP
Hands free talking: Yes
Battery: Li-Ion 830 mAh, replaceable

is Bluetooth connection with ANC activated and spatialisation effects on, and you get about six hours. If you disable Bluetooth and use line-in, that can be expanded by a further hour, boosting up to 18 hours if you use line-in and turn off spatial processing.

Obviously, using it on USB, there are no limits, as its being powered and simultaneously recharged. As wireless battery life goes this isn't horrible, but others have achieved longer. These can also be charged with a Qi charger, for those who find physical connect so last decade.

Almost everything about these is very modern, including touch-sensitive controls with almost no visible buttons. Volume control is achieved by stroking the right can with a finger, and pausing requires just a single tap. There are even sensors on the ear cushions that sense when you remove them to automatically activate mute.

However, the volume control is highly sensitive, and it and other controls only seem to work when you use a Bluetooth and not USB connection.

As you might reasonably expect at this price, they sound very good, even when you're using Bluetooth. However, the best result I experienced was while watching a DTS audio movie on my PC connected by USB.

If there's a weakness in the audio spectrum, it's that the drivers can't produce enough low frequency bass for my liking, but being battery powered, I understand why.

The downside of using them on a PC is that there's no corresponding app for this platform, like the iOS and Android one, so you can't make playback processing adjustments like you can on a phone.

These are very minor problems for the most part, and there's only one thing substantially wrong the Zik 3 to my mind, and that's the high price. Given the superb build quality and excellent audio quality, it's probably worth the cost, but that's going to be far too much for the majority people.

They're cheaper than the Sennheiser's Momentum Wireless, if that's any consolation to you. I wish they were cheaper, because they're made and designed to a level that all technology products should truly aspire to.

For those who'd like a similar feature set without the full price, Parrot still sells the previous Zik 2.0 design, and those can be found for about £170. **mm Mark Pickavance**

Heavy on the pocket, lovely on the ears

Intel i5 And i7 Processors

Intel Core i5-6400 2.7GHz

micro mart
Quality 7
Value 8
Overall 7

DETAILS
- Price: £150
- Manufacturer: Intel
- Website: goo.gl/txuaUY
- Requirements: LGA 1151 motherboard, DDR4 memory for best results

Intel processors are widely regarded as the best for all-round PC duties, and they've come a long way in a few short years.

The problem is, though, there are so many generations and numbers associated with the i5 and i7 range that it's often difficult to see the silicon from the chips, so to speak.

To give you a better idea of what's available, check out these six chips.

The i5-6400 is a decent, well priced CPU

The i5-6400 was released toward the end of last year and sits neatly in the mid range of Intel's desktop processor series.

It's based on the Skylake architecture, so this particular 64-bit chip uses a 14nm manufacturing process, together with other such features as 6MB of L3 SmartCache, 1MB of L2 cache, support for DDR4 1866/2133 memory and an integrated Intel HD 530 GPU, which runs at a base frequency of 350MHz and a boost frequency of 950MHz.

It's a four-core processor with a base frequency of 2.7GHz and a maximum turbo frequency of 3.3GHz. While 2.7GHz may not seem much by today's standards, it's generally more than capable of delivering a decent amount of punch. The 3.3GHz boost is only for two of the cores but can still offer a reasonable burst of speed when needed.

Although this particular processor sits in the middle of the Intel desktop range, it's actually the entry point for the i5-series. The price of around £150 is very reasonable, and Intel has managed to pitch the i5 technology at such a low price by dropping the base clock speeds and, of course, by limiting the unlocking. As with most processors, though, given the right motherboard and BIOS, there's a good chance you can squeeze a few more megahertz out of it.

Power consumption is good too, rated at 64W, which is about average for most of Intel's Skylake i5 processors, aside from the i5-6600K, which tops the scales at 91W.

Graphically, the HD 530 GPU isn't going to set the gaming world on fire, but there's support for DirectX 12, at least. Furthermore, the GPU can support 4K at 60Hz, Intel Wireless Display technology and up to three monitors. While it's not really a gaming-level GPU (which integrated GPUs are?), it's more than adequate as a media centre processor.

Using the PassMark version 8.0 benchmark, we saw a CPU mark of 6,580 and a single thread score of 1,860. According to comparative research taken by PassMark, this puts the i5-6400 at a point just above an AMD FX-6300 six-core processor and a couple of points below an AMD FX-8350 eight-core CPU.

The Cinebench R15 single-core score was 142, while the multi-core score was a reasonable 499. Again it's not the fastest processor in the world, but it's more than enough for 99% of the duties most folk will expect from their PC. Couple it with a good dedicated graphics card, and it will make for a worthwhile and reasonably priced gaming PC.

Basically, the Intel Core i5-6400 is a good start to Intel's sixth-gen CPUs. It's well priced, performs within adequate benchmark scores, and you won't need expensive components to build up around it for an effective system.

It's a particularly powerful processor

Intel i5-6500 3.2GHz

DETAILS
- Price: £165
- Manufacturer: Intel
- Website: goo.gl/U0DcfL
- Requirements: LGA 1151 motherboard, DDR4 memory for best results

▲ *The i5-6500 is another good sixth-gen processor*

➤ *It's also a decent performer and competitively priced*

Pitched at a point above the i5-6400 is the i5-6500, another sixth-gen Intel processor that takes the benefits offered by the more entry-level i5-6400 and adds a couple more enticing elements to the mix.

This is a 3.2GHz 64-bit processor, with four cores, 6MB of L3 SmartCache and a turbo frequency of up to 3.6GHz. Since it's a sixth-gen model, there's support for DDR4 memory up to 1866/2133MHz, a TDP of 65W and an integrated Intel HD 530 GPU.

The obvious difference between this model and the i5-6400 are the base and turbo frequencies. The extra 500MHz of base clock speeds can make a significant difference on the application you're running – more specifically if you're doing the more intensive CPU tasks such as transcoding a video or even gaming.

The GPU side of things has seen an upgrade too, with a maximum boost frequency of 1.05GHz, although the base frequency of the GPU still sits at 350MHz. 4K support at 60Hz is available, as you would expect, as well as DirectX 12 and a variety of other Intel display and video technology. Generally speaking, it's a better integrated GPU than that of the i5-6400, but don't expect it to rival the capabilities of even the entry-level dedicated graphics cards.

The i5-6500 is priced reasonably well, at around £165. This makes it a more attractive prospect than the higher-end K-labelled unlocked processors, and when compared to the i5-6400, the extra £15 or so you'll spend give you a little more processing grunt for your money.

Our PassMark 8.0 overall CPU scored 7,068, with a single thread score of 1,956. This is a fair bit higher than the i5-6400, meaning it's better for CPU-intensive applications as well as gaming.

The Cinebench R15 single-core test score was good at 154, while the multi-core score came in at 569. Both are promising scores for those who are after a decent performing processor and, as we mentioned with the i5-6400, when paired with an equally capable dedicated graphics card and other components, the i5-6500 would make for a better than average gaming system.

Overall, the Intel i5-6500 is a good processor. It's at an interesting price, before things start to hit over £200, and it performs well too. Naturally, those who are thinking of squeezing as many megahertz out of their processor will opt for the K-versions, but for those who want an all-round good system, the i5-6500 won't disappoint.

Intel i5-4690K 3.5GHz

DETAILS
- Price: £210
- Manufacturer: Intel
- Website: goo.gl/6yMBqe
- Requirements: LGA 1150 motherboard, DDR3 memory

The i5-4690K is an impressive, if older, processor

It's still the CPU of choice for many gamers

Although the Intel i5-4690K is a fourth-gen processor, it's still regarded as one of the best value chips available. Even fairly recent gaming PCs valued at over £1,000 have included the i5-4690K.

More recent PCs will undoubtedly opt for a sixth-gen processor, but the i5-4690K still has a lot to offer. The base frequency comes in at an impressive 3.5GHz, with a maximum turbo frequency of 3.9GHz for one of the cores and 3.7GHz across all four cores.

There's a 6MB L3 cache, support for DDR3 1600MHz memory, and the integrated GPU is an Intel HD 4600 with a base clock speed of 350MHz and a turbo frequency of up to 1.2GHz.

The obvious benefit to using an older processor is the price difference, but in this case you're going to pay a little more for an i5-4690K. You can shop around for one, but the average tends to lean toward £210, which may seem a little bit pointless considering you can buy newer technology for a good £40 less. The major attraction here, though, is the fact this is an unlocked processor.

While the base frequency is an already good 3.5GHz, we've seen this processor being overclocked to a mightily impressive 4.8GHz and still remain quite stable. Dig a little deeper into the overclocking powers of this wonderful little chip and you'll begin to see some pretty big numbers when coupled with liquid and more high-end cooling solutions.

> "Dig a little deeper into the overclocking powers of this wonderful little chip"

With that in mind, you're certainly getting a fair amount of gigahertz for your money, so it's little wonder the i5-4690K was the darling of the gaming world.

While overclocking is something a lot of users do, it's not the main reason the vast majority of folk will buy a processor. With that in mind, our benchmarks are for the base clock speeds, without any overclocking used.

The PassMark 8.0 overall CPU test came back with a more than reasonable score of 7,705 and a single-thread score of an equally good 2,230. The Cinebench R15 single-core score was 153, and the multi-core score 539.

These scores are impressive, considering the age of this processor, and there's always the overclocking potential to consider too.

Even using the stock speeds, the i5-4690K is certainly a processor to consider. It's a great performer, there's plenty of potential to squeeze a lot more performance from it, and it's not too badly priced.

The downside is that you're buying into technology from 2014, and while there's nothing wrong with that, it may hinder you for future upgrades some years down the line. It's also quite power hungry, with a TDP of 88W.

Intel i7-4790 3.6GHz

DETAILS
- **Price: £250**
- **Manufacturer: Intel**
- **Website: goo.gl/pLBX36**
- **Requirements: LGA 1150 motherboard, DDR3 memory**

The i7-4790 is a good performer, but its K-model sibling is a better buy

This i7-4790 is a fourth-gen Intel Hyper-Threading processor, having been released around mid-2014. It features a base clock speed of 3.6GHz, a turbo clock speed of 4GHz for one of the cores and 3.8GHz across all four cores.

The TDP is a little higher than the sixth-gen i7 processors, those being around 65W as opposed to this model's 85W. The integrated GPU in this case is an Intel HD 4600, which manages a base clock speed of 350MHz and a turbo boost speed of 1.2GHz – exactly the same as the i5-4690K that came out at around the same time.

As you can see, this isn't the unlocked K-version of the i7-4790. The K-model offers a higher base clock speed and, of course, it's unlocked, so you can push it to higher overclocked frequencies than you would ever be able to achieve from this model.

The benefit of the i7-4790 is of course the higher base clock speeds over the i5 processors. 4GHz through the turbo function isn't something to take lightly, even in this day and age, but the £250 price is still high.

In terms of performance, the i7-4790 looks pretty good. The PassMark 8.0 overall CPU score was an impressive 10,018, while the single-thread score was also a pretty good 2,298. Meanwhile, the Cinebench R15 single-core score was a rather lacklustre 148, but that improved with the multi-core test which was 730.

The integrated GPU on the i7-4790 may not be the best available, but you can't argue with the fact that this is a processor with a considerable amount of grunt behind it. With that in mind, it'll make for a great gaming CPU or for other processor-intensive tasks.

Although this is one of the highest performing processors this week, we do have a couple of reservations. The first is the fact that this is, in terms of the processor timeline, old technology. As with the i5-4690K, you're buying into fourth-gen technology, and while that isn't too much of a problem at present, it could become a thorn in your side at a later date.

The second problem we have is with the price. Even though it's a good performer, £250 seems a little steep for two-year old technology, plus for around £40 less you could get the i5-4790K and a slight overclock to match the performance benchmarks.

On the whole, though, the Intel i7-4790 is a decent enough processor. It'll take everything you throw, and it'll no doubt be around for a while yet.

It's getting a little long in the tooth now, and it has little overclock potential

Intel i7-6700K 4GHz

DETAILS
- Price: £280
- Manufacturer: Intel
- Website: goo.gl/DiYQvf
- Requirements: LGA 1151 motherboard, DDR4 memory for best results

▲ *The i7-6700K is an exceptionally good processor for the price*

➤ *Since it's also unlocked, there's heaps of overclocking potential*

> **"A worthy processor for both power users and gamers alike"**

The current top-of-the-range sixth-gen desktop processor in Intel's line-up is the i7-6700K. However, its launch late last year didn't quite drum up the enthusiasm that was originally hoped for.

The lack of enthusiasm for the i7-6700K was probably due to the fact that it never really brought anything new to the table. It's still a quad-core processor, with eight threads and running at 4GHz, with a turbo speed of 4.2GHz. But what the media and users did rejoice in was the return of Intel to the serious overclocking market.

Before we get to the overclocking part, though, the i7-6700K comes with support for DDR4 memory at 1866/2133MHz, and you'll find an Intel HD 530 integrated GPU with a base clock speed of 350MHz and a boost speed of 1.15GHz.

Since it's a more modern generation of processor, it offers support for all manner of advanced technologies, the vast majority of which most people will never utilise, but for the business user the specs are pretty impressive.

Back to the overclocking side of the processor, the i7-6700K has seen some remarkable feats in recent months, with some elaborate liquid nitrogen setups. For the average enthusiast, however, you can expect a stable clock speed of up to 4.8GHz with a decent air cooler in place. Just to note, though, we never pushed ours as far as that.

There have been instances of liquid cooled chips going as high as 4.9GHz, but the majority of them tend to blue screen when the processor is being pushed.

In our tests, we remained at the base frequencies, which may seem a little boring, but doing otherwise would skew the results. For the PassMark 8.0 overall CPU test, we managed to get a score of 11,003, and for the single-thread benchmark the score was an equally excellent 2,345.

The Cinebench R15 single-core test came back with a score of 182, while the multi-core test was 889. We can only speculate as to what a slight overclock would do to those scores.

Although the i7-6700K didn't get as much headline news as Intel wanted when it was initially released, it has since proven itself to be a worthy processor for both power users and gamers alike. There's enough processing power here to support high frame-rates, as well as crunch big numbers and speed up image and video processing.

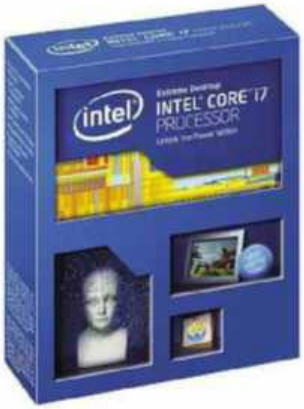
The only major downside is that it costs in the region of £280. But for that amount you're getting the latest technology, as well blisteringly fast base speeds.

Intel i7-5930K 3.5GHz

micro mart
Quality 7
Value 5
Overall 6

DETAILS
- **Price: £490**
- **Manufacturer: Intel**
- **Website: goo.gl/zGSL9u**
- **Requirements: LGA 2011-v3 motherboard, DDR4 memory for best results**

The i7-5930K Extreme Edition CPU is a multi-core monster



For single-core duties, though, it's a pretty poor processor

Toward the end of 2014, Intel released a trio of fourth-gen Extreme processors: the i7-5820K, the i7-5930K and the i7-5960X. These are the premium end of the processor scale, so you can expect to pay a pretty penny to get your hands on one.

The i7-5930K is a beast of a CPU. A six-core, 12-thread powerhouse, with a base clock speed of 3.5GHz and an oddly meagre turbo boost of just 200MHz to 3.7GHz.

As you would expect from a processor of this calibre, you'll need to make sure you have the right components in place to begin with. The TDP of 140W is eye watering, but you can take advantage of DDR4 memory up to 2133MHz. And the 15MB of L3 cache is just as impressive.

As impressive as the i7-59030K may be, it's also a kind of a backward step in terms of the technology used. By this we mean there are no integrated graphics available, so you'll need to invest in a dedicated card to push the pixels across the screen. This will ultimately drive up the overall cost of an i7-59030K system, but if you're already considering spending the £490 price for this CPU, we imagine you'll also be able to afford a graphics card to go with it.

Naturally, since this is a K-model chip, it's unlocked and can therefore be overclocked. While there doesn't seem to be quite the leap in megahertz as we've already seen from the K-version CPUs, the i7-5930K has been clocked to a stable 4.6GHz with some pretty dramatic results. From what we've seen, the benchmarks of such an overclocked processor are among the highest listed.

As far as its stock speeds go, though, the benchmarks we ran are just as good. The PassMark 8.0 overall CPU score was 13,635, the highest we've seen so far. Unsurprisingly, the single-thread score was a far lower 2,082 – not that much better than the i5-6500 and certainly less than the i5-4690K.

The Cinebench R15 single-core test score was also quite unremarkable. At just 140 it's the lowest of the entire group – two points less than the entry-level i5-6400. The multi-core score, though, was impressive at 11,54.

With those scores in mind, it's worth considering the uses the i7-5930K will be put to before you go out and buy one. If you're planning on running multi-core applications and you need to address a huge amount of system memory, then this is an exceptional processor and will happily see off the competition. On the other hand, if all you're doing is running single-core programs and pure clock speed is more important, then you're better off with one of the standard desktop processors.

Obviously, the Extreme Edition CPUs have their place, but £490 is a lot of money to fork out for only a slight gain in the benchmarks compared to the i7-6700K. If you factor in an overclocked i7-6700K, then you could be looking at a processor that will beat the i7-59030K in pretty much everything.

Component Watch

Component Watch

Ready to take a punt on a wearable? You don't need to break the bank...

Apple's high-end Smartwatch might not have taken the world quite by storm, but that doesn't mean there aren't a lot of good reasons you may want one, especially if it was considerably more affordable. Connected devices always have their uses, and we suspect that these sub-£150 devices do just as much of the things you want a smartwatch to do at a fraction of the cost of big-budget market leaders.

Deal 1: HANNspree Prime SmartWatch
RRP: £60 / Deal Price: £50

Arguably the cheapest smartwatch around, the HANNspree Prime has a 1.54" OGS touch display with micro SIM support and TF storage up to 32GB. Although it can pair with, and remotely control, a phone its SIM support means it can also function as a stand-alone device with much of the functionality of a smartphone. The built-in 0.3 MP camera can be used for video calling, and you get a vibration function, music player and sound recorder built in as well. Great for budget buyers.
Where to get it: Ebuyer (**bit.ly/1TXs4h1**)

Deal 2: Martian Notifier Smartwatch
RRP: £80 / Deal Price: £70

The Martian Notifier has more to offer than just a weird name. It's a combination analogue/digital smartwatch, with a classic analogue face that contains a small LCD screen for text alerts and other notifications. Connect it your smartphone to receive call ID notifications, preview text message and other push notifications, and even issue voice commands to your phone. There's no touchscreen, but tapping the glass will dismiss notifications. It's also designed for fashion with multi-coloured, easily-changeable bands. Ideal for those who want their watch to look good without sacrificing digital features.
Where to get it: The Watch Shop (**bit.ly/1UpsWdN**)

Deal 3: Alcatel ONETOUCH Smartwatch
RRP: £114 / Deal Price: £80

The ONETOUCH has a 1.22" full-colour display, with four different colour and strap combinations and a huge number of features, including fitness tracking, phone control and notification alerts. It's waterproof at depths of up to 1m and has oleophobic coating to minimise grease and fingerprint marks. Compatible with Android 4.3 or iOS 7.0 and above, it also has built-in wi-fi for standalone use.
Where to get it: Argos (**bit.ly/1tcIUl8**)

Deal 4: Sony Smartwatch 3 SWR50
RRP: £150 / Deal Price: £100

This Android Wear smartwatch from Sony has a 1.6" transflective display that minimises reflection and glare, making it perfect for use in natural light. Fully app-powered, it has a 320x320 pixel screen, 4GB of eMMC storage, voice, touch and gesture input and NFC communication. It's also got a built-in compass and a battery that can power it for 2 days between charges. All that and the Sony mark of quality and an incredible discount. What's not to like?
Where to get it: PC World (**bit.ly/250m4hV**)

Deal 5: Asus ZenWatch 2
RRP: £150 / Deal Price: £103

The Asus Zen Watch is an Android Wear watch with 4GB of storage with a leather band and over 100 customisable LCD watch faces for the 1.63" screen. There's voice, touch and gesture input as well as a microphone and NFC communication capabilities. Optimised for Android 4.3 and later, it's also compatible with the iPhone and has built-in GPS with scratch-resistant gorilla glass. Everything you could possibly want and more!
Where to get it: Venture Direct (**bit.ly/1tcJ6AO**)

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The Download Directory

James Hunt scours the internet for the best freeware, shareware and paid-for application releases

This month,the Download Directory's collection of offbeat and largely undiscovered applications includes Tablacus Explorer, a tabbed-browsing file manager with support for gestures; Instagram Saver, an application that allows you to back up your entire Instagram account in a single click; DiskDigger, a general-use undelete program; Paragon HFS+, which allows you to read OS X drives on Windows, and Instagiffer, an animated-gif creation tool to rival and professional software.

Tablacus Explorer 16.6.2

Release Type: Freeware
Official Site: www.eonet.ne.jp/~gakana/tablacus

When it was first introduced, tabbed browsing was a revelation in the way we used the internet – so you might be wondering why the concept never made it to file explorers. If you'd like to find out for yourself, Tablacus Explorer might be the easiest way to do so.

In theory, it's a good idea. Tablacus Explorer aims to put as much power in the hands of the user as possible, with support for tabbed browsing, customisable menus, even gesture support. It's portable and incredibly small, but overflowing with ways for you to configure it. Open a new tab by pressing a button, middle-clicking a tab or drawing a specific gesture with the cursor. Delete a file in as many ways. Switch from one pane to four in a single click. In theory, it sounds great.

But the reality is that it's just too disorganised for the concept to work. Four panes, each containing multiple tabs, means it's too easy to lose your place. Multiple ways to perform one action mean you're never quite sure what the best way to proceed is. Documentation is sparse and the organisation of the software is all over the place, with settings presented in vague and non-specific terms.

Since the author's site is hosted in Japan, it's probable that it's written by a non-native English speaker, and that's how it comes across. In all fairness, it needs a good editor to straighten out the terms and explain the advanced features in a way anyone other than the developer can understand. In both copy and design terms, it needs a pretty extensive rework to bring it up to standard.

Don't get us wrong – the tabbed functionality works fine – but if anything's going to convince you that tabbed browsing makes sense for file explorers, this isn't it.

Pros: Tabbed function works fine.
Cons: Confusing and unclear settings.
Rating: 2/5

InstagramSaver 1.7

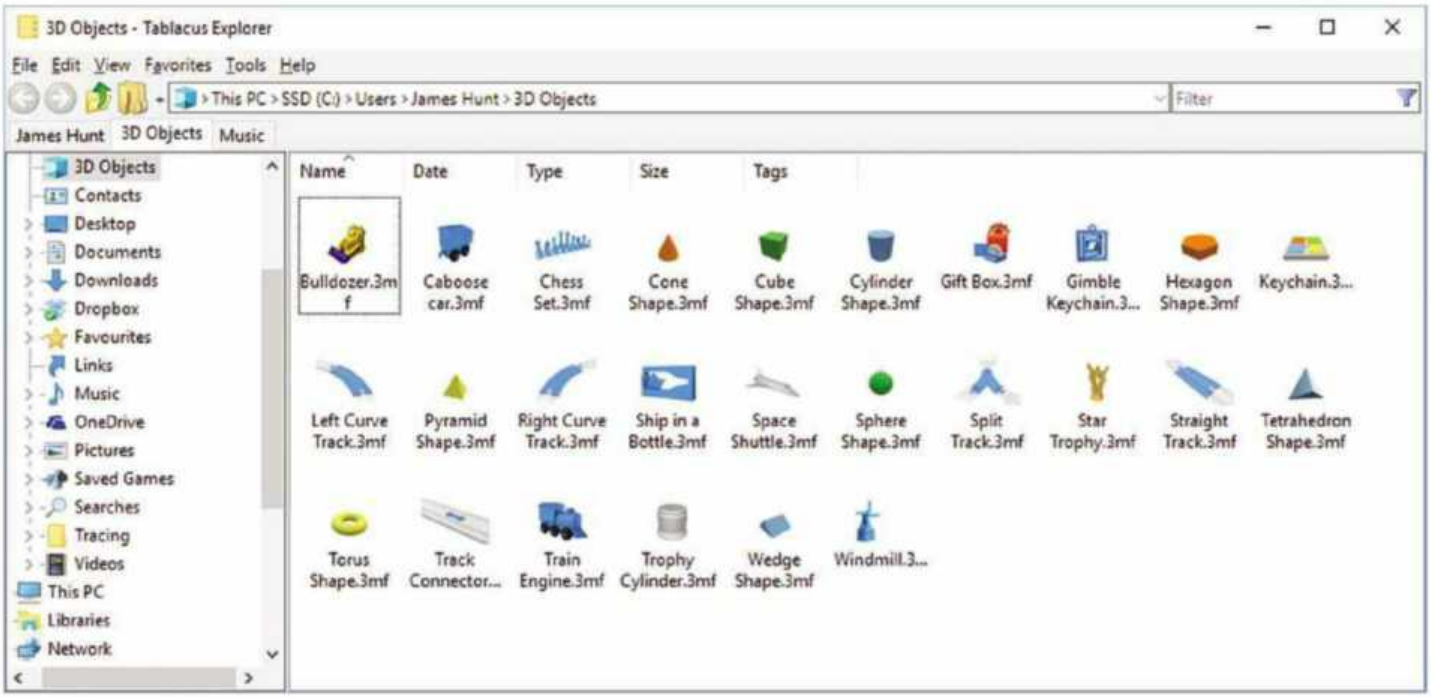
Release Type: Open Source
Official Site: instagramsaver.sourceforge.net

If you use Instagram to store and share your photos online, you might be irritated to discover that there's no way for you to download your archive. Even doing it manually can be something of a chore! For that reason, developer Ozok has created this small application, which can do the job for you, allowing you to save the contents of any Instagram account at the click of a button.

The app's features are simple but powerful. It harvests both photos and videos, can download up to 16 separate things in parallel, making efficient use of your connection, and it's even available in portable form so you don't have to face the inconvenience of installing the software if you only want to use it once. There are both 32- and 64-bit versions available, so it should be compatible regardless of what version of Windows you're using.

Using the program is incredibly simple. All you have to do is put in the username of the (unlocked) account you want to save files from, then hit go. The files will be automatically saved to a pre-specified directory, allowing you to keep them as backups wherever you prefer. There's almost nothing else to it: a settings dialogue lets you set the number of parallel downloads and helps you prevent it from downloading the same files twice on multiple uses. You can also turn off video downloads if you're not interested in those.

If we were to criticise anything, it's the lack of an obvious workflow to using the application. It's sort of been thrown together, which means the layout isn't very logical, and there's nothing to direct you towards the additional options before you've tried using it once, so there's a



good chance you'll have to make a few passes of your account while you try to figure out how to use the software effectively.

But that's only if we were going to criticise it, and really, we're not inclined to. It's fast, simple and works perfectly. That's something we find a lot with small applications that have a definite focus, and it's a good advert for not making your scope too wide or allowing your ambitions to exceed your grasp. Even taking into account its limited scope, there's practically nothing InstagramSaver should do that it doesn't. More features would just mean more bloat, and that's something we'd rather do without. Definitely a useful tool, and one we're happy to recommend.

Pros: Easy to use and good at what it does.
Cons: Slightly confusing layout – but only slightly!
Rating: 5/5

DiskDigger 1.8

Release Type: Freeware
Official Site: dmitrybrant.com

Ever since we started the Download Directory, we've made it our business to find the perfect undelete tool. Most of them have exactly the same problems: they're confusing, slow, and nine times out of ten they don't work in any remotely practical sense, offering more false hope than last-minute salvation. It's with this mindset that we approach DiskDigger, the latest undelete program we've encountered.

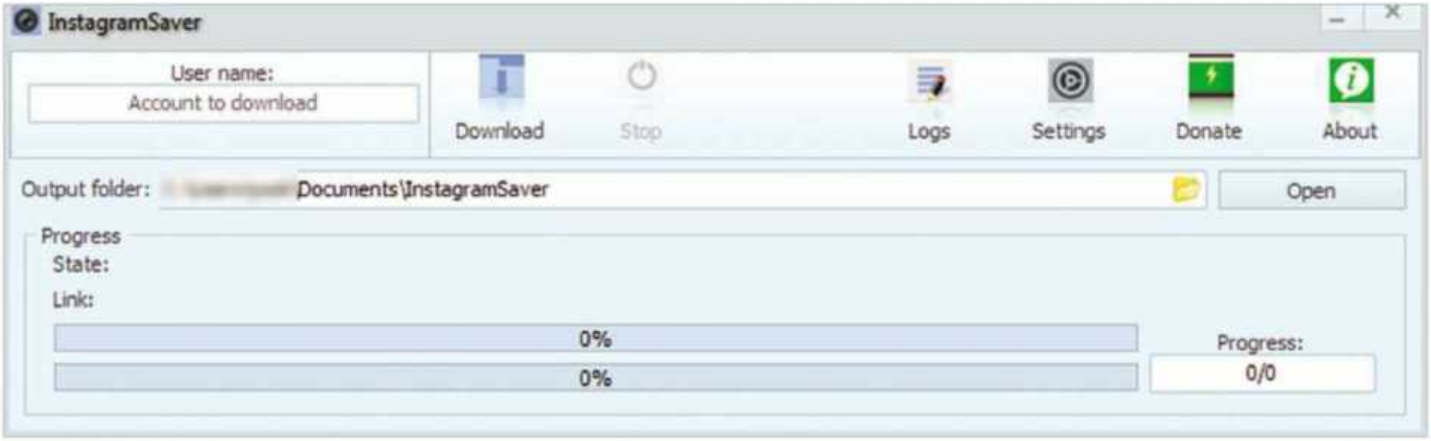
It wins points immediately for being portable. When you're trying to undelete files, the last thing you want to do is run an installer, given that every disk write destroys potentially recoverable information. All you do is launch the file, choose a drive and let it run.

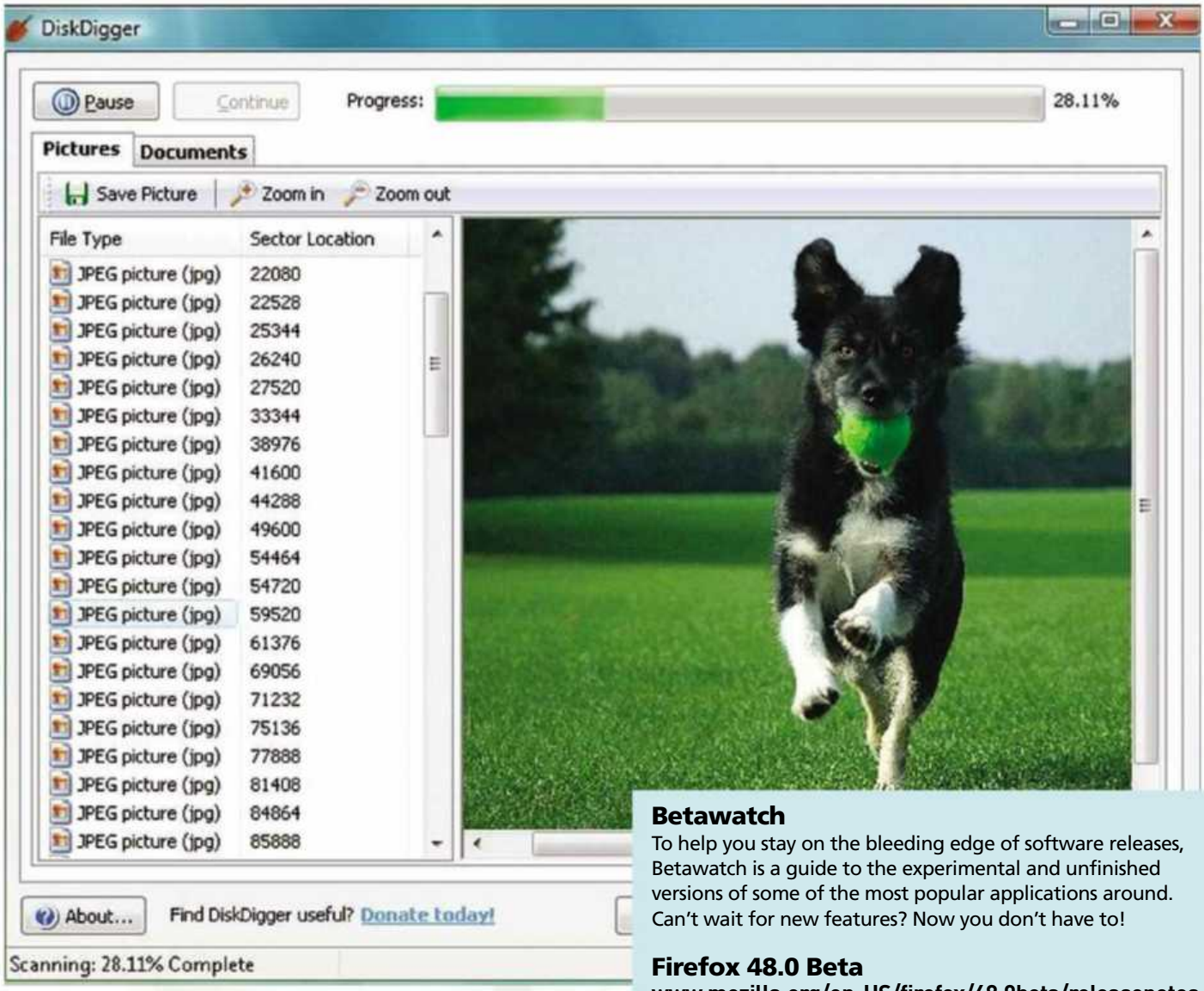
Somehow, DiskDigger manages to be much faster than most undelete programs. There's no indication of why that might be, but it's self-evident and definitely a welcome quality. Once the deleted files have been identified, it's easy to filter out the ones you might want (all docx files or only JPEGs above a certain size, for example) and restore only the ones you do.

But best of all, there's a built-in file preview, which allows you to see a file before you restore it, at least where possible. This feature is conspicuous in its complete absence from most undelete programs, and the fact that DiskDigger implements it is a huge time saver and another massive point in its favour. Never again will you restore a generically named file only to discover it's not the one you wanted.

The software is in active development too, so new features are being added all the time. The most recent version – the second major update this year – came out in June, and adds improvements to the recovery of various file types, obscure and common. If you like the software, you can use it on Windows versions from XP to 10, and there are alternative versions available for Linux and Android.

It might not be the most fully featured undelete tool, nor the most impressive-looking, but in this case it's results that matter, and in that





case, DiskDigger does it better than virtually anyone else – especially when you take into account the fact that it's freeware. It's not quite well-designed enough to recommend to every user, but if you're confident in the process and mechanics of undeletion, it's going to be your new first choice.

Pros: It's fast, and it works.
Cons: Clearly designed by a programmer.
Rating: 4/5

Paragon HFS+ Free 1.0

Release Type: Freeware
Official Site: www.paragon-software.com

If you've ever tried to get Windows to read an OS X partition, you'll appreciate how frustrating the process can be – especially if you've got a dual-boot system with Windows and OS X on one hard drive! The reason is that Macs use a different file system to Microsoft-reliant systems: the latter uses NTFS, the former uses HFS+. Asking Windows to read HFS+ is like asking a chimp to read Japanese, but as you've probably guessed, Paragon HFS+ is a program that manages to come up with a workable translation.

What's special about Paragon HFS+ isn't what it does, particularly. There are plenty of programs that can do exactly the same job. The interesting thing here is that you don't have to pay for it, and there are few if any alternatives that do this job for free.

Betawatch

To help you stay on the bleeding edge of software releases, Betawatch is a guide to the experimental and unfinished versions of some of the most popular applications around. Can't wait for new features? Now you don't have to!

Firefox 48.0 Beta

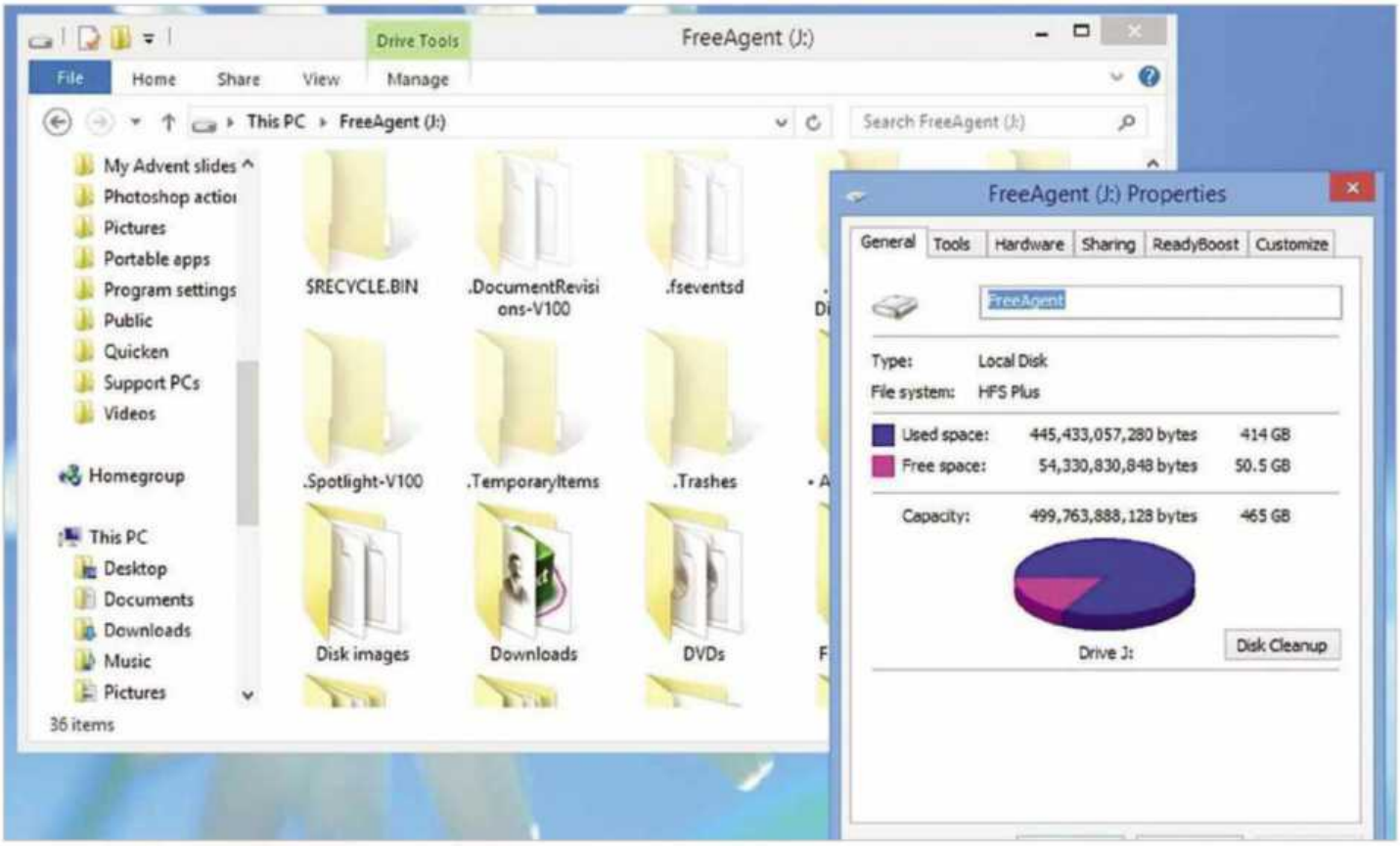
www.mozilla.org/en-US/firefox/48.0beta/releasenotes

Released just the day before this was written, Firefox's 48th version is packed with new features to test and enjoy ahead of the full release some weeks down the line. You can expect to see at least some of the following if you choose to install it:

Enhanced protection against malware downloads (sounds vague, but good), a new design of the URL bar result panel with more results, Skia, the graphic library, is now enabled by default on GNU/Linux for better canvas performances, and keyboard shortcuts Tab and Shift+F10 are now also supported in Firefox customization mode.

If you own a Jabra headset or Logitech C920 webcam, you'll be pleased to hear that the distorted audio problems are fixed (a genuine bug!), while step debugging has also been improved. Support for Firefox has officially ended on OS X 10.6 to 10.8, integration with Windows Remote Access Service modem autodial has been removed, and WebRTC has been improved in various ways.

Finally, developers get a whole bunch of new additions to the Developer Mode, but the memory tree map view, Firebug theme and Web Crypto API are probably the best of those. As ever, you can download and try the latest Firefox update now.



ReDownloaded

This month, in our regular retrospective section, we're looking back at the June 2014 instalment of Download Directory to see how the programs we reviewed have fared. Are they better? Worse? Gone completely? Here, we find out.

BlueStacks App Player

www.bluestacks.com
Reviewed Version: 0.8.10, Current Version: 2.2

The BlueStacks App Player allows you to run an Android Environment from within Windows, making it a hugely useful tool whether you want to test Android apps out or run your existing phone/tablet software while you're at your PC. Although when we looked at it two years ago it wasn't quite ready, the latest version has more than worked out the kinks. We'd go so far as to call it virtually essential for anyone who has both a desktop system and a mobile one, whether you want to access some applications that have no desktop version or play games that are only on Android. You can even use it for *Minecraft*.

Gadwin PrintScreen

www.gadwin.com
Reviewed Version: 5.1.0, Current Version: 5.5

The default Print Screen behaviour of Windows is about as basic as it gets, so it's hardly a surprise that there are loads of applications that attempt to extend that functionality in useful and practical ways. Gadwin PrintScreen is a tool for making and organising screenshots of your desktop with tons of features, and even an image editor (in the paid-for pro edition). There are loads of programs like it, but that fact that this one has kept updating makes it definitely worth sticking with if you want something more powerful than Windows alone can offer.

Rufus

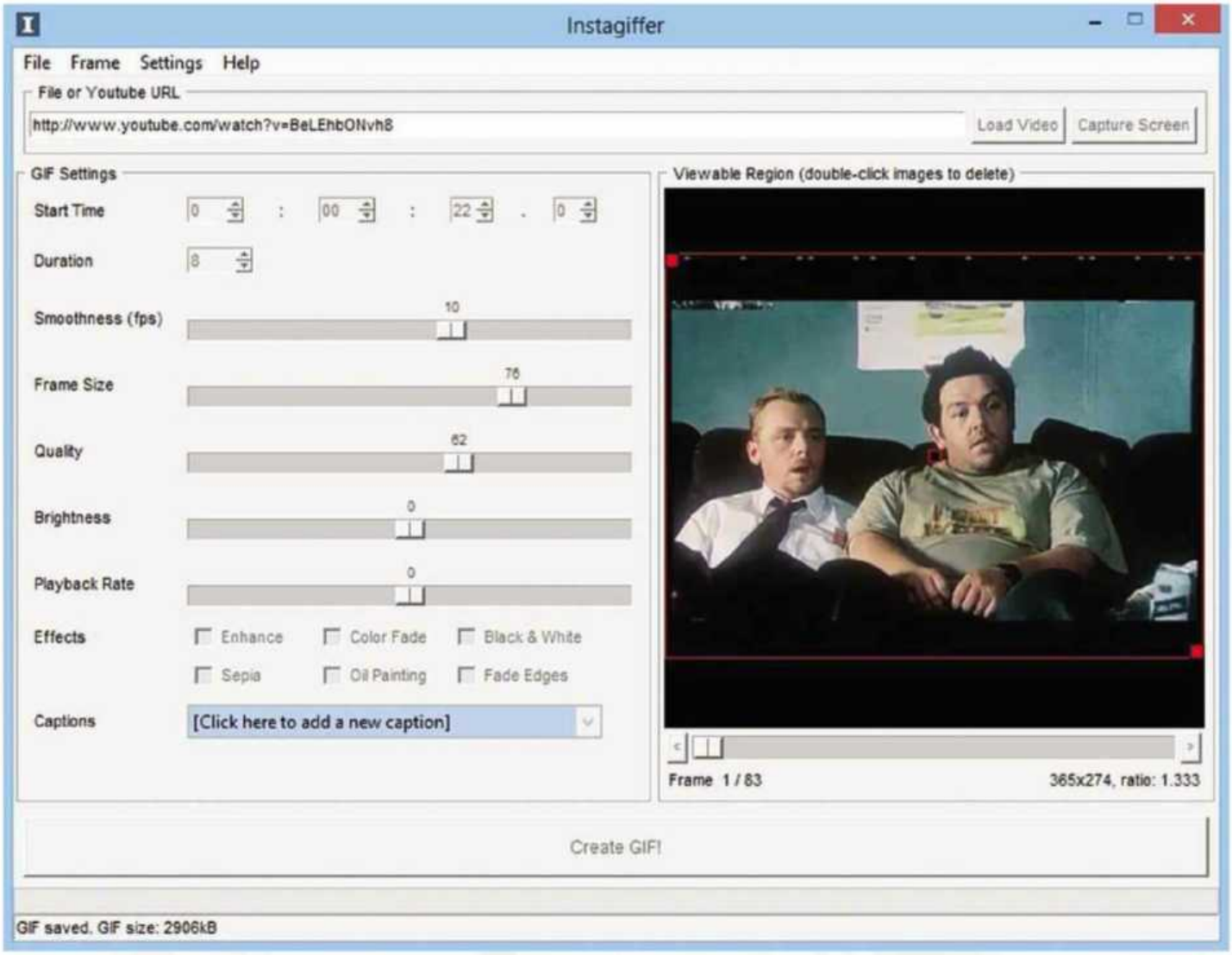
rufus.akeo.ie
Reviewed Version: 1.4.7, Current Version: 2.9

In the past, creating a boot disk was simple: you only had to format the floppy and leave it in while you booted the PC. Things got more complicated now that some PCs lack even an optical drive, and the bootable USB drive isn't very easy to create at all – but it is if you've got Rufus, which gives you a huge range of tools designed to let you create a bootable USB drive from any .iso image in just a few clicks. It already did everything it had to when we first looked at it, and the program has been updated virtually monthly since then. It's a joy to see such dedicated support from a developer.

CTI Text Encryption

www.codeplex.com/site/users/view/adriancs
Reviewed Version: 5.3, Current Version: 6.0.1

CTI Text Encryption is, as the name suggests, a text-encryption tool that is designed to allow you to write up sensitive information and then send it in encrypted form over potentially insecure channels, such as social media direct message, email or even online chat programs. It's an odd little tool with powerful mathematical underpinning, let down by a confusing interface. We're not sure there's a huge amount of demand for an oddity of this type, but at least the developer deserves credit for sticking with it. Unfortunately, a major update hasn't corrected its major failings, so there's no real reason to give this one another chance right now.



Compatible with Windows 10, Paragon HFS+ will allow your Windows PC (or a Mac with Windows through Boot Camp) to freely access any drive formatted with HFS or HFS+. Where some programs and drivers restrict you to read-only, Paragon HFS+ does read and write without any trouble at all. It just works, and that's the beauty of it. Once it's installed, HFS-based drives will appear as normal, accessible at full speed, and act just like any other storage area on your system.

The sole caveat is that if you want to access mac-formatted drives from older versions of Windows (XP, Vista and 7) or access the latest version of the file system (HFSX), which is found on OS X 10.3 and above, you have to get the paid version. But when a program works this well, it's more than worth paying for.

Pros: Works instantly, straight out of the box.
Cons: Free version lacks some features.
Rating: 5/5

Instagiffer 1.73

Release Type: Freeware
Official Site: instagiffer.com

Once the big joke of the internet and scourge of GeoCities, animated GIFs have come back in a big way. The world of memes, reaction GIFs and Tumblr imagesets are now dominated by animated GIFs, and that means no self-respecting internet user who wants to be down with the kids should be without one. For many people online, this means abusing a pirated copy of Adobe Photoshop. But what if you want to do it legitimately?

If you don't have a copy of Photoshop around, Instagiffer might be the tool you need. It can create animated GIFs from virtually any animated source, including YouTube clips and videos. It's not as simple as it could be – you don't select start and end points, instead picking the start and then selecting a duration (so it normally takes a few goes to get the right frame to end on) but it's usable, if not perfect.

Aside from that, the rest of the interface and feature set is good. You can easily pick the frame size and playback rate, you can filter the image to have different video effects on it, you can alter the brightness and quality and overlay captions. The tools are laid out in a logical and easy-to-understand way, which means you can get the image you want in just a few clicks once you know what you're doing. Once that's done, hit 'Create GIF' and the program will spit out an instantly usable file.

Instagiffer clearly knows its audience too. As well as being light on technical options, it's also got a function that checks your images for Tumblr compatibility and warns you if it's too large or in the wrong format. That sort of thing might not be useful to everybody, but a vast chunk of Instagiffer's audience is going to love it. For that matter, so will Adobe. It's lightweight, easy to use and as powerful as it needs to be. Definitely a success.

Pros: Knows its audience and tailors the software to them.
Cons: The initial frame-selection process is bafflingly unintuitive.
Rating: 4/5 mm

Remembering... MS QBasic

This week we go back to basics

Despite having dreams of wanting to program my own games, with an aim to one day become a developer, I never really progressed much past BASIC.

While BASIC is fun, it's not exactly something that many software houses look for when considering a CV. I eventually found tinkering with the hardware and playing around with batch files more fun, but there's still a little part of me that wanted to reach the heady heights of z80 assembly or even C programming.

One of the last BASIC environments I toyed with was Microsoft's QBasic, as run within DOS – specifically DOS 5.0. QBasic felt quite natural, even when coming from a Spectrum BASIC background, and if you had the hang of it, you could come up with some pretty good programs and games.

I'm going to assume that most, if not all, reading this will have fond(ish) memories of Nibbles, Money Manager and the ever wonderful Gorillas.bas? Although fairly simplistic, the aforementioned programs taught us how to better structure our own versions, and they led to the inevitable hacking of the supplied games to give your gorilla a nuclear powered banana.

QBasic was easy to use, it was accessible and since it used the same Edit.com front end (Edit.com being the editor-only mode for QBasic), you could use it for other tasks and batch file programming.

Its History

QBasic was the third generation of PC/IBM low level languages. The first example was, of course, BASICA, created by the Dartmouth College team of John Kemeny and Thomas Kurtz. After that came the Microsoft developed GW-BASIC, which was available from DOS 2.0.

After GW-BASIC, Microsoft developed QuickBASIC, a more capable version that introduced the compilation of the source code into the command line – an EXE file. QuickBASIC lasted until version 4.5, when it was finally replaced by QBasic in 1991 with the release of DOS 5.0.

QBasic (Quick Beginners All-purpose Symbolic Instruction Code). It introduced a structured environment, with support for subroutines, While loops and even line numbering – although line numbering was considered to be bad form.

It stayed with DOS well into Windows ME, rising to version 1.1 throughout that time but without Edit.com.

Sadly, as with most of the really good DOS-based stuff, QBasic was eventually laid to rest, with the far more capable Visual BASIC and .NET languages taking over from Windows XP and onward (incidentally, Visual BASIC came out the same time as QBasic).

Did You Know?

- By pressing left Ctrl, left Shift, left Alt, right Ctrl, right Shift and right Alt just after pressing Enter from typing in qbasic in DOS, you get a list of the programming team.
- You can use QBasic online via the Internet Archive at goo.gl/yf0Bg9.
- You can enter the Editor mode by typing: qbasic /EDITOR.
- You can play Gorillas.bas online at **goo.gl/ZCLpJx**.

The Good

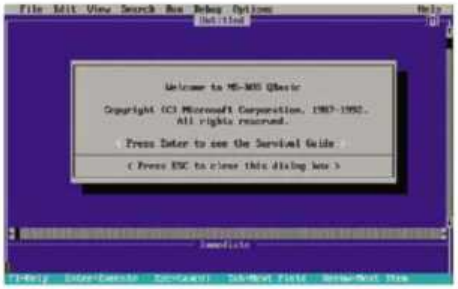
It was an easy, nicely laid out language to get to grips with. Gorillas.bas and Nibbles!

The Bad

There were times, especially if you were using it on an older PC, that it ran phenomenally slowly.

Conclusion

Although I never advanced to the lofty status of a high-level programming language, I loved the layout and environment of QBasic. And since you can still get hold of it, in some form or another, even for Windows 10 machines, I still have an occasional try at creating a BASIC adventure game. **mm**



QBasic, where many a modern programmer was born

Some of the programming within could become quite complex

Gorillas.bas, a game that was played during many a night shift

RETRO ROUND-UP

This month, almost everything 'new' is a conversion or revamp of either an 80s arcade machine, an 80s icon or an original 80s trend-setter. Join David Edwards as he discovers if there are more diamonds among them than the obvious gleam in Rockford's eyes...

Astro Blaster

BBC Micro, Retro Software,Free, tinyurl.com/z6bbe43

If you were around the early 80s arcade parlours, you might recall *Astro Blaster*. One of Sega's early games, it's a vertical shoot-'em-up. It equips you with a laser and invites you to clear waves of aliens, but requires you to 'pace yourself' to actually do so.

The problem is that each time you unleash a bullet, there is a small increase in the temperature of the 'blasters' of your ship. If you act like a kamikaze Rambo, it won't be too long until the blasters overheat and refuse to work until they've cooled. Instead, you must duck under the alien wave and try to only fire when a bullet is certain to make its mark.

Astro Blaster has now, some 35 years after its arcade debut, appeared on the BBC Micro. Once again it's under the Retro Software label, it's free and it's coded by Richard 'Tricky' Broadhurst, who also gave us the arcade conversion of *Frogger* raved about in MM #1410.

As with *Frogger*, *Astro Blaster* is a flawless conversion of the Sega arcade game. It uses the BBC's high-definition, four colour mode (Mode 1), retaining the arcade's detail, colours and resolution. Indeed, it even includes the famous "Fighter pilots needed in sector wars" sampled speech (it's not often that Beeb games talk!). Sound otherwise is restricted to blasting and blipping noises but, all told, it's a good enough game.

A good enough game, that is, for those who are fans of the arcade. I'm not one of them. Firstly, I don't like being forced to 'pace myself' in the way this game demands. Enduring ten second stretches without being able to fire irritates me. Secondly, that strategy of pacing I described earlier doesn't actually work. The aliens here very rarely bob about in a formation that allows you to pick them off with strategy. No, the aliens bob around. More often than not, if you hit one, it's a matter of luck rather than judgement. Which means, to stand any chance of taking them out, you have to unleash the very volleys of firepower that overheat the blasters in the first place!

Thirdly, some formations immediately come streaming down the screen and sit literally millimetres from the tip of your spacecraft. You are expected to get underneath these and take them out. An exercise in impossibility.

So while this is undoubtedly yet another amazing feat of programming, I am somewhat lukewarm to it. Personally, I'd much rather load up BBC shooters *Galaforce* or *Firetrack*.

Carnival

BBC Micro, Retro Software, Free, tinyurl.com/zc5ecoe

Carnival is another 80s Sega arcade machine now coded up on the BBC Micro by Richard Broadhurst of Retro Software. This man must never sleep...

Carnival is quite a simplistic game. The object of the game is not to run out of bullets. This equals instant game over. You start the game with 60 of them and a laser base at the bottom of the screen facing three stacked, scrolling rows of mixed ducks, rabbits, bullets and the letters B, O, N, U and S.

Ducks on the bottom row are a constant menace, because they can, without warning, dive towards the bottom of the screen and munch away a random number of bullets.

Shooting anything on the left-hand side of the screen is riskier than elsewhere, because if you miss, you may find your bullet hits a penalty box, also erasing bullets.

Obviously, firing bullets loses them too. Only shooting boxes of bullets will replenish them.

And so the scene is set for a rather chaotic game in which you can employ myriad strategies to try to gain that coveted top rung of the high-score table. All the action is set to a typical fairground piece, with bullets giving a satisfying squelch on impact.

Astro Blaster
Graphics 65%
Sound 35%
Playability 75%
Technical Achievement 100%
Overall 69%

Carnival
Graphics 50%
Sound 50%
Playability 80%
Technical Achievement 100%
Overall 70%

Astro Blaster's Mode 7 opener

Some waves of aliens rain down on you

Carnival is loading. Please wait...

Ah, yes, we all remember this one

This new game doesn't actually offer anything particularly new; there are at least two other versions of it already on the BBC Micro with comparable qualities. But it's enjoyable because, being a direct port of the arcade original, it's like playing the 'official' conversion, which is kind of cool.

Popeye

Spectrum 48K/128K, Gabriele Amore, Free, tinyurl.com/j6fdv5a

You may remember our coverage of *Popeye for the Vic 20 in MM #1390*. Beamrider faithfully converted the arcade original, pushing the Vic 20 to its limits, and I awarded it an overall mark of 70%. That was despite its blocky graphics and the occasional difficulty in discerning what was going on due to the cramped playing area. Gabriele Amore has now attempted the same job on the Spectrum 48K.

The basic premise of the game is that you play Popeye the sailorman, collecting the hearts thrown into the playing area by Olive Oyl. You must avoid Bluto, and the bottles he throws at you, collect up a quota of hearts to proceed to the next level.

With an extra 32K to play with on the Spectrum compared to the Vic, you'd be forgiven for expecting the same game with better graphics. I was expecting that when I loaded it up. I was very quickly disabused of these expectations.

Honestly, there are so many problems here that I find it difficult to know where to begin.

Firstly, there are no instructions. This was also a problem with the Beamrider version. The original arcade game contains a large amount of 'cartoon style' features (being able to drop a bucket on Bluto's head, for example), but without any indication of how to operate them, you're left with your own guesswork. This is time-consuming, annoying and unnecessary. If you can be bothered to convert a game, then supply it with some instructions, so those who want to play it can indeed do so.

Start the game and you get the familiar four-level screen one, with Olive at the top and Bluto pacing around below. So far, so good. Oddly, the screen freezes, and you have to press M to start the game at this point. I have no idea why, but let's do that and get the action going.

Your problems begin almost immediately. In the original, you descend from the starting platform by going to the extreme right and walking diagonally down the stairs. But in this version, the stairs are, in fact, the biggest danger to your health. Firstly, they are not hard right against the sides of the screen, so it's possible to fall off them into a 24px wide area that doesn't exist in the original. This is the exact area often occupied by the bottle-throwing Sea Hag. You see the problem?

Having worked out that you must spin around and sort of 'fall' down the stairs diagonally (that is, walking to the edge of them and landing on the next one), you may need to immediately retrace your steps because Bluto is on the platform throwing bottles at you. In the original, it's a cinch, diagonal up-right as you would expect. Here you must actually jump up the stairs one at a time. This takes time you don't have. Don't even get me started on trying to attempt to get from the final stair up to the platform above: you're more likely to throw your Spectrum out of the window than pull this off! Oh, and none of these quirks affect Bluto. He doesn't have to jump the stairs at such a slow speed, so he will immediately catch up with you. And that's one life down.

Next, everything moves in 8x8 CHR$ 'jumps' rather than by smoothly scrolling machine code. This means that, even if you keep well out of the way of the Sea Hag and Bluto, their bottles come jumping across a very small area at breakneck speed, while the best your character can do to avoid them is waste a screen-move executing the 'punch' or jump in the air.

Not that jumping in the air helps. The collision detection is so bad that, although Popeye is safely out of harm's way mid-air, the bottle still registers a hit – two lives down.

What about the famous cans of spinach that render you impervious to Bluto? Surely collecting one of those would make the game playable, even if just for a short time? Well, I wouldn't know. As you can see from the screenshots, there are two accessible cans of spinach only a short walk from the starting position. However, one of them is positioned almost permanently behind the Sea Hag and the other doesn't seem to get picked up even when you walk right up to it and hammer on the fire button. Or maybe it is picked up and I am invincible to Bluto, but I just don't know it because there's absolutely no change that would reflect it.

How terrible is this conversion? Well, if you stand extreme right and press the punch key, you'll see your extended first appear one line down screen left!

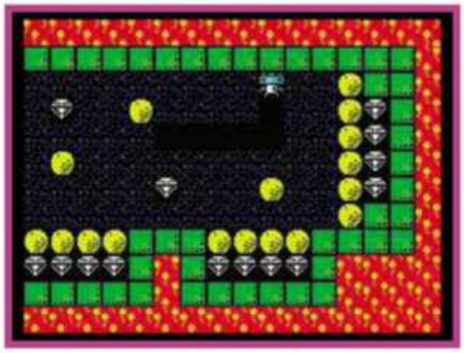
On a good day, you might just be able to collect up enough hearts (by good luck rather than any skill) to see the second screen. I

Popeye
Graphics 25%
Sound 70%
Playability 5%
Technical Achievement 0%
Overall 25%

A promising start...

Your biggest enemy is the stairs.

Bombford's the name...



No messy Spectrum palette clash here

haven't managed it, and I have really tried. It's so difficult just to move about that you'd have to be suicidal to try to attempt any of those more 'cartoony' inclusions. Mind you, I'd doubt if they're even implemented properly. There's no intro with the *Popeye* music, Popeye doesn't blow his toot-toot pipe, and even the introduction with the two competing for Olive's attention is missing. In addition, even the simple arcade quirks (which Beamrider all managed to include in a computer a third of the Spectrum's size) are missing. Bluto never even tried to grab me from the platform above or below!

The only good thing about it is the music, apparently added by Alexandro 'Seto Taisho' Grussu after the code itself was written.

If your programming skills aren't up to the job yet, don't start with a 'fast and furious' arcade conversion like *Popeye*. It's a waste of time for everyone.

Tourmaline

Retro Souls, Spectrum 48K, Free, tinyurl.com/zmkyj3g

When other publishers are churning out the latest definitive version of a familiar format, Retrosouls always seems to be playing with that format a little to produce a wholly new type of game. The force behind *Gravibots*, *Special Intergalactic Painter* and *Alter Ego* now gives us a cross between *Boulder Dash* and *Bomber Man*: *Tourmaline*.

Most people know the *Boulder Dash* formula; it's an overhead maze game where every sprite is 32x32 in size, and you tunnel through blocks of earth, collecting the diamonds and trying to avoid the rocks, which will fall if not balanced on earth.

Even more people know of *Bomber Man*; even the modern(ish) system like the Nintendo DS have versions of this overhead maze, where you drop bombs to blow up patrolling nasties.

Put them together and you get *Tourmaline* – essentially *Boulder Dash* with bombs. You take control of 'Bombford' (*Boulder Dash* featured a character called Rockford) and your task is, as you might expect, to collect up the diamonds from each level. Levels are several times the screen size and scroll up, down, left or right when you reach an appropriate area of the screen. The scrolling that does this is very jerky.

Given the legendary coding skills of Denis Grachev, the jerky scrolling is entirely intentional. *Boulder Dash* had the same; it's an affectionate nod to the original and done that way to please the fans of it. Indeed, it's quite odd how this jerky scrolling affects the dynamics of the *Boulder Dash*/*Tourmaline* experience. On most professional maze games, smooth scrolling is employed, keeping Rockford in the centre of the playing area. Employing this technique necessarily slows the game down. If you dispense with it and simply shift the screen 32 characters in any direction, you get an absolutely frantic gaming experience. Hence the name Boulder 'Dash' – in *Tourmaline* too, you can race about the mazes at manic speed, unseating boulders, collecting diamonds, avoiding nasties and causing complete chaos.

Equipping your character with an infinite supply of bombs too also ups the ante. If *Tourmaline* were a puzzle game (that is, if you had to complete each screen a certain way to be assured of success), then allowing you to blast rocks to smithereens would, of course, totally counteract that logic. But *Tourmaline* isn't a puzzle game. Granted, it looks like one. But it's 100% arcade action. When you're dealing with patrolling nasties coming at you through that jerky scrolling, while rocks and diamonds rain down all around you, and you need to blast patrolling monsters too, it takes the game to a whole new level.

Tourmaline is one of those games that, now it exists, will satisfy a thirst that *Boulder Dash* fans hitherto never knew they had. It's free, it's frighteningly addictive and yet another addition to Retrosouls' growing catalogue of tremendous Speccy games. Each game gives you five lives, and you'll need them.

Jewel Warehouse for the Amstrad CPC

Beautiful, cool graphics

Jewel Warehouse

Amstrad CPC, Ego-trip, Free, tinyurl.com/gvyc9yt

I haven't seen anything from Amstrad publisher Ego-trip before, but a new game for the Amstrad CPC is always welcome, and *Jewel Warehouse* is a surprisingly addictive puzzle/platform game, which rehashes some familiar elements.

There are very few instructions for this game and, indeed, it's one of those games designed in such a way that you don't need them. It's obvious from the get-go that your aim is to collect the ten jewels from each screen, that you can stand on striped boxes and that you will die if you fall on the spikes.

Throughout the game, a sprightly little tune plays, and there's no lives system. You can retry each level as many times as you wish and, as they increase, so do the 'elements' present on them. Conveyor belts – which can leave you stranded in a section of the screen – are introduced circa screen three. Fires – which need to be put out by a collectable extinguisher – are introduced circa screen five. Disappearing platforms come later.

Jewel Warehouse is colourful and very responsive, working with cursor, joystick or the traditional (Amstrad) AZNM key controls. In many ways, it's what any game should be all about. It's remarkably easy to get into and quite fun to play. The earlier screens you can

dive into without any thought, while on later ones, you'll find yourself having to ponder over the solution before you start.

If I had one criticism, it would be that it doesn't try to do anything really 'new'. Retrosouls' recent *Alter Ego* (available for the Spectrum, Amiga and Nintendo, see MM #1393) really astonished me with a wholly new twist on the traditional platformer. This is good, but it's standard platform fare and by no means astonishing.

Palace Of Magic 2016

Acorn Electron, Mr. Quazar, TBA, tinyurl.com/z25s7at – Retro Find Of The Month

Unlike the BBC Micro, its brother the Acorn Electron hasn't had a new game in years. This may seem quite puzzling considering the two share the same Basic/Assembly language firmware, but the two machines themselves are intrinsically different. The low-resolution, seven colour Mode 2 of the BBC, for example, runs about 190% faster than the same Mode on the Electron. This meant that, back in the day, you would often find new games released with a BBC version on one side of the cassette and an Electron version on the other. The BBC version was always superior.

A case in point is *Palace Of Magic*, which was written by Martyn Howard and released in November 1987. The BBC Micro received a glorious seven-colour Mode 2 version. The Electron received a less-glorious four colour Mode 5 version, its author choosing to redesign all of the sprites of the palace rather than try to stick with Mode 2 on the Electron and try to reduce processing time.

▲ *Palace Of Magic is here, after 30 years...*

▲ *Leave the frog alone!*

Well, some 30 years later, *Palace Of Magic* 2016 manages to recreate the original BBC Micro Mode 2 palace on an Acorn Electron. In the game, which was a sequel to the genre-defining *Citadel*, you play Caldeti, reduced in size and stranded in the palace of an offended god. Your task is to solve the mysteries of the *Palace Of Magic* by bounding about, shinning up the ropes, avoiding the patrolling nasties on the platforms and moving the items you find around the rooms, allowing every route through the palace to be opened up. Once you've managed it, you will discover a transporter to quit the palace and will be restored to your normal height – in short, what became typical graphic adventure fare.

Great touches of the game include the 'red screen save routine' which, if you plunge into a pit of spikes or spend too much time occupying the same sprite space as one of the baddies, automatically transports you back to the point at which you entered the room. There's also much more involved than 'find key A and unlock door A with it'. A pair of magical boots will allow you to jump three times as high when collected, for example. A sword will allow you to start wiping out certain nasties rather than just having to jump them. A candle will light up dark rooms. A coiled rope will automatically uncoil in the right place. And so on.

In assessing *Palace Of Magic 2016*, you really need to compare it not with just the original Acorn Electron version but with the BBC version it has been converted from. Differences in the hardware between the two machines, for example, mean that, on the BBC, a short piece of machine code will 'shake' the screen. So if Caldeti falls a long way, the impact will not only drain his energy bar but will send the screen twanging up and down. The Electron has no hardware scrolling whatsoever, so the original version simply dropped this effect.

Palace Of Magic 2016
Graphics 83%
Sound 33%
Playability 90%
Technical Achievement 100%
Overall 77%

This new version somehow manages to replicate it!

The lack of colours in the Acorn Electron version also led to the keys and doors being completely different to the BBC. Where the BBC could use many different colour combinations to represent the keys and doors, the Electron owner was reduced to letter codes. Instead of a yellow and blue key, they got a simple key labelled A. This new version dispenses with these shortcomings too.

Indeed, no programming stone seems to have been left unturned in the author's own quest to wring every last instruction out of every last machine code cycle on the little Elk. The game even automatically compensates for whether the Electron it is running on is equipped with the Master Ram/Turbo board. The only real difference I found was that, on some emulators, the sound made when Caldeti jumped seemed to be about a quarter of a second too late.

Overall, though, this is a much improved version of the Electron *Palace Of Magic,* and any Acorn Electron owners who have never seen this superior version would be advised to get it immediately.

That's It!

With so much new stuff, there was no time for lengthy intros and outros this month. All of the games featured are free to download, so follow the tinyurls to Everygamegoing to download any that interest you. See you next month! **mm**

Tourmaline
Graphics 50%
Sound 67%
Playability 84%
Technical Achievement 84%
Overall 71%

Jewel Warehouse
Graphics 63%
Sound 55%
Playability 75%
Technical Achievement 73%
Overall 67%

Life After Office 365

If you wish to move away from Microsoft's Office 365, what are your options? We have a look.

Once upon a time, Microsoft's Office was found on a disc and was installed locally on your PC. Considered by many to be the best and most powerful office suite around, the Office series was hugely popular and was found in both homes and offices around the world. It pretty much set the standard for office suite features and design, and has introduced much more power and flexibility into the genre of software than mere word processing and spreadsheets.

Of course, it still is popular and you can still buy Office on disc if you like and if you can afford the steep price. However, there's another way to experience Microsoft's premier suite of productivity tools and that's via Office 365, the cloud-based, subscription service the suite has evolved into.

This service still retains the locally installed apps for home users, much like a standard disc variant, but the software is grabbed from the internet and comes with a range of extras not usually available. This includes the ability to work across multiple devices, such as PC, laptop, tablet and so on, and there's a larger amount of online OneDrive storage. Subscriptions can also span more than one user, so the whole

▲ *Office 365 is arguably the most powerful office suite around, but also the most expensive*

family can use it, and it integrates Skype (60 minutes per month per user on the licence). The software can also be accessed anywhere, thanks to the cloud-based nature.

This isn't an advert for Office 365, though, and although it's an undeniably good office suite, not everyone wants to use it or wishes to keep paying for the subscription. Often, people who do use the software do so because a subscription came with their hardware, such as a new tablet. These may include a free, limited time subscription, and once it's up, payment needs to be made to continue using the service. It's not uncommon

"Many users who previously used Office and swore by it now find themselves drifting to other software"

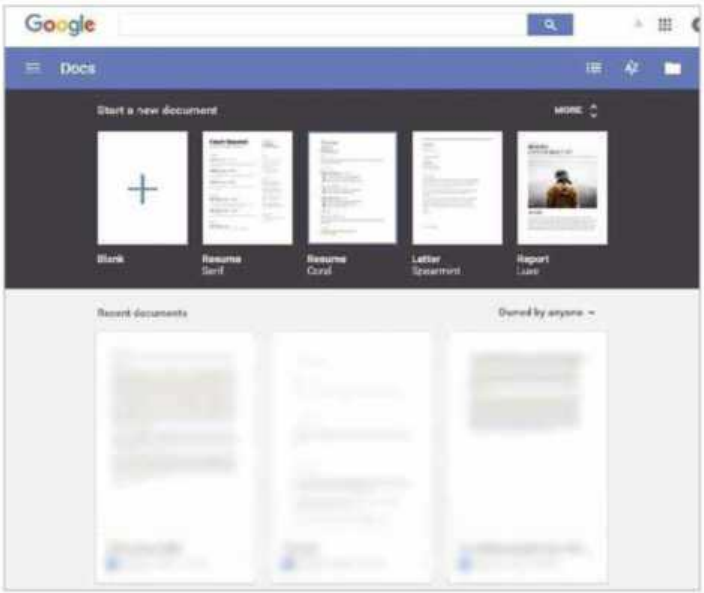
for users to shy away from this, but there's a problem. You've got work you've undertaken using it, and you have a wealth of contacts and other information within the suite. What can you do if you want to move on, and what choices are there for alternatives? Can you even get your data out of Office 365 to use in another package? Let's find out.

Leaving So Soon?

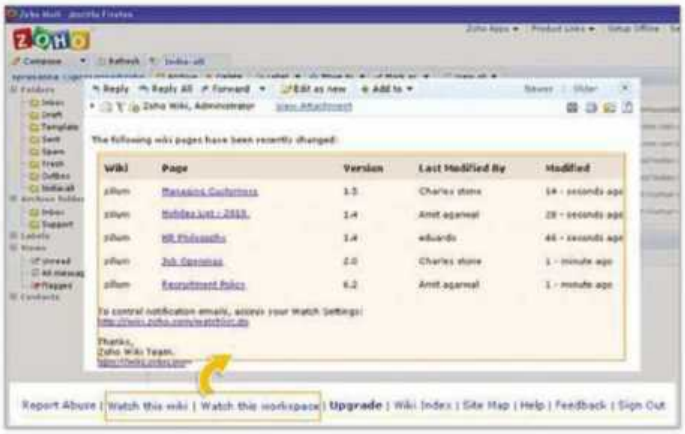
First, it's wise to consider why you're leaving Office 365 and if you really wish to. This may sound like a silly question, and most would simply quote the price to carry on using the app. Be aware, however, that Office 365 is a very good suite, and it does have features others lack, especially some free options. This may not be much of a problem for home users who don't make use of many advanced features, but it may affect some. It's certainly wise to have a look at the competition, which we'll be mentioning later. If a subscription doesn't bother you too much and you want to find a cheaper option, still consider these features, because packages that may be cheaper might not have what you need or have become used to in your time with the free trial.

The cost of a standard, five-user home version of Office 365 is currently £7.99 per month. If you only need a single-user licence, it's £5.99 per month. A one time purchase of Office Home and Student 2016 is £119.99. This is to buy the full package for one PC, with no need for a subscription. That's a lot of money.

Still, money isn't the only reason to move. Many users who previously used Office and swore by it now find themselves drifting to other software, either due to changes made to Office or simply because of more accessible and convenient options. For example, although Microsoft's OneDrive (previously SkyDrive) services are popular, the dominance of DropBox continues, and many prefer the alternative online storage. It's



▲ *Google Apps is the dominant online office suite competition*



Zoho is a powerful, feature-packed online office suite

free (for limited storage) and requires no ties to a subscription. Other alternative services appeal in this way. Some users just don't want complexity, and while the free subscription period saves time and money, granting access to a decent service, when it comes to paying, there's just no point if you're only going to use a tiny fraction of the power on offer.

> **"There are the people who want to leave, but are afraid to do so"**

Then there are the people who want to leave, but are afraid to do so. As we've already mentioned, people may have data and information they need, and their concerns about losing this could prevent them from turning down an Office 365 subscription. This shouldn't be a concern, and there are ways to take your data with you when you leave. We'll also look at this soon, so whatever your reasons for leaving, let's move on to the options.

Alternative Offices

Google Apps

apps.google.com

Without a doubt, the most popular alternative to Microsoft's Office 365 in terms of online functionality, and perhaps even better in terms of cloud integration, Google Apps is a truly great option for almost everyone. Well, at least that used to be the case. Once totally free, Google Apps is now a paid-for service like 365, but if you already accessed it before the change in pricing, you should still have free access. This is likely, as many will have used it at some point. Unlike 365, it's heavily cloud-based, with no need for local installations of software, Google Apps features a full office suite of tools that are accessed online, with full online storage and collaboration tools, including the ability for multiple users to edit documents at the same time.

It's very flexible and is also easy to use and manage. It makes use of several modular apps that can all communicate with each other, much like any decent office application. However, as always, there are some downsides. For one, Google Apps is

ThinkFree is just that: free

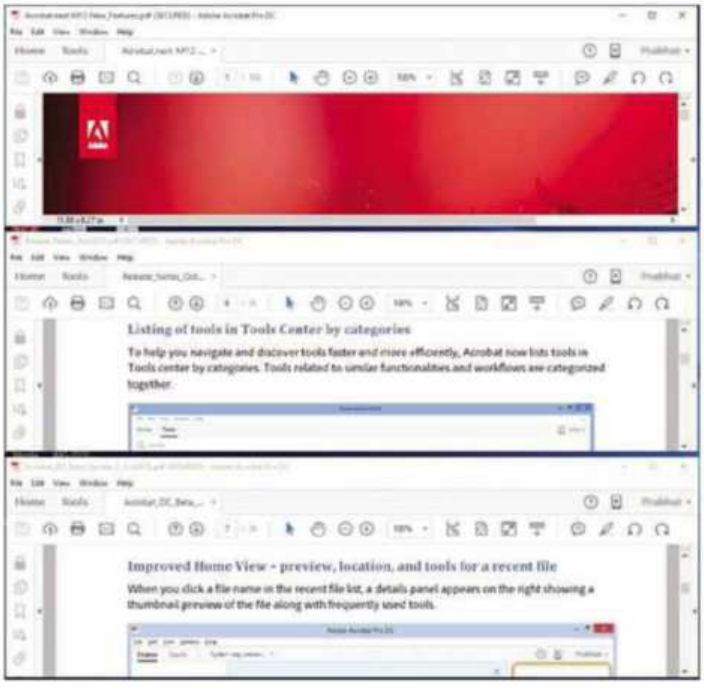
not as powerful as Office for advanced users, especially those who like to customise their office tools with VBA scripts and a bit of coding. Google Apps has some script support, but it's just not as powerful, which is a common downside to moving away from Microsoft's suite. MS Office, in whatever guise, has always been the powerhouse, and it's why it's always been successful in the business sector. Still, Google Apps has a lot of third-party tool support, so if there's something you need the vanilla package doesn't have, you'll probably be able to add it.

Still, even with this loss of power, Google Apps is a constantly growing presence in the workplace and is used more and more as a professional collaboration tool. Although it's not totally free for everyone any more, and there's a business cost for branded email addresses, for home users with existing Gmail accounts and previous access to the service, it's a prime solution. Even if you need to pay, the cost is less than 365, weighing in at £3.30 per month for the base package and £6.60 for the premium option.

ZoHo

www.zoho.com

Free for personal use, ZoHo is probably the most feature-packed online office suite around, and it crams in a mass of tools and applications, including word processing, spreadsheets, presentations, email, notes, wikis and much, much more.



Adobe's online option is all about the PDF

Live Documents is a decent online set of office apps

The suite is aimed at business use when you dig deeper into it, and the premium rates come into action for additional user accounts. As we said, however, it's free for personal use. For this reason, it's a good option for those who need power, but we found the interface to be less appealing than the wealth of features. There's little uniformity, and some apps run differently, which can throw you off a little as you move from one app to the next. If you're used to a more uniform application, you'll have a bit of adjusting to do here, but with the power and variety on offer, it's a small price to pay.

ThinkFree Online Office
member.thinkfree.com
This free suite has been created using Java, so there is an installation, although it still runs within a browser. Unlike a lot of online office suites, which rarely look or behave exactly like a standard program, ThinkFree does feel like a real application and looks and feels just like MS Office.

It's a very capable suite that can hold its own, although it's not all that speedy in operation, mainly down to the use of Java, which we all know isn't the fastest language in the world. Also, you cannot use the suite offline unless you buy the £35 suite outright. As we're looking at alternatives to Office 365, which is very expensive to purchase, this isn't all that much of a problem. Even if you do need it to run offline, it's far cheaper than Microsoft's package, so you'll still be saving a lot of money. The use of Java doesn't quite make the offline option all that attractive, though.

Acrobat Document Cloud
While ThinkFree uses Java, which can be slow, it's faster than some, including Adobe's Acrobat Document Cloud suite. This is a Flash-based service, and it can actually run slower than ThinkFree on some systems, although this will depend on your system spec. We're including it is mainly to show how not to do an online service, which extends past the language used and performance speed.

Acrobat Document Cloud is very basic compared to other options, with far less in the way of tools, and the free status of the package is very limited. Documents you create have to be exported out of the service in PDF form, and you can only do this a limited number of times before you're forced to pay for a subscription. This effectively robs the package of any use for those looking for a free option. Even if you pay, being forced to use Adobe's PDF format is just plain silly and means this is one to avoid, but it's a good lesson that not all products from well-known names are worthwhile.

Of course, if you're looking for a package that deals with PDF files and it's the only format you need to use, you'll find no option better than one from the company that created the format in the first place.

Live Documents
www.live-documents.com
A flash-based office suite done right is Live Documents, 'Office for the internet Generation.' This is a more accomplished office suite, and it uses a unique virtual desktop GUI system that makes it much more natural for users when browsing through

Staying With Office And Microsoft's Next Move

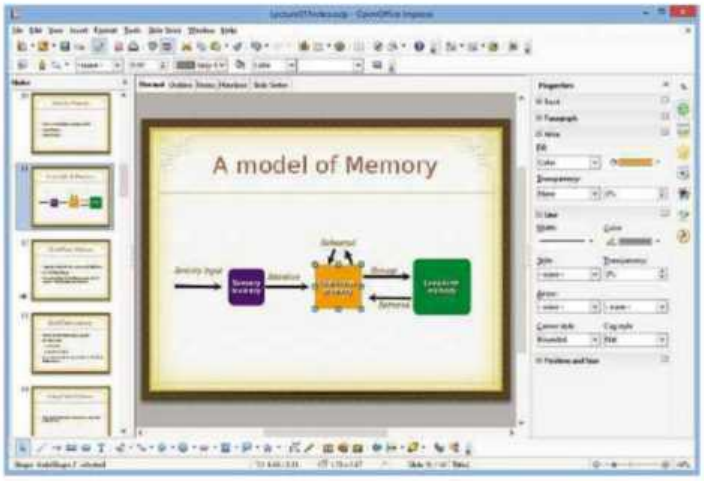
Although we're focusing on the wish to migrate from MS Office, we should also ask the question of whether you should migrate at all. We've outlined the major reason of cost, and in this regard there are few arguments for the home user that would persuade anyone not to ditch Microsoft's suite in favour of a free option, especially when there are such solid alternatives around. Having to pay per month just to type up documents may seem too steep for many.

However, even home users need power from time to time, and there's something to be said for MS Office's lead in the office suite market. Microsoft's tool are very good, perhaps the best around. This is debatable, of course, but with so many people using the suite, it's hard to argue against the overall quality of the tool.

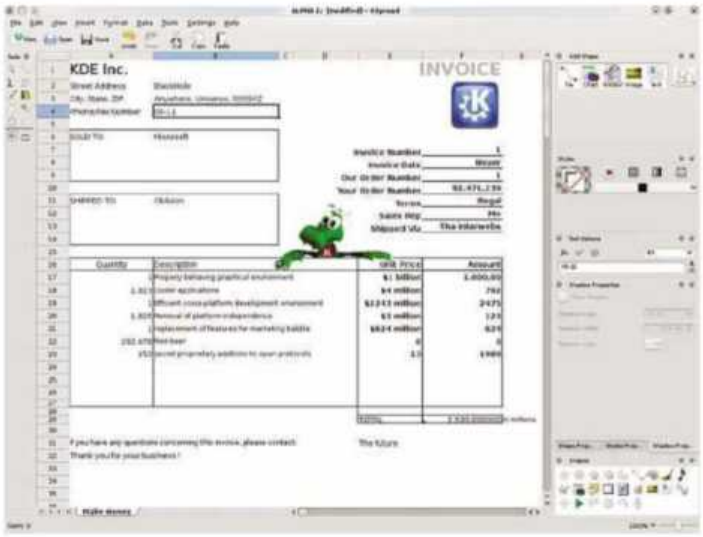
The problem here is Microsoft's unwillingness to embrace the modern office suite marketplace. With the popularity of free suites like OpenOffice, control of the market is no longer possible for Microsoft, and with its suite traditionally costing a lot of money, a lot of ground has already been lost. The rise of online software could have been what Microsoft needed to recapture the home user, but with a monthly cost still involved and free options abundant, it leaves Office as a luxury for most.

For this reason, Office is and has long been considered more of a business tool. In fact, it's always been the higher-end option, with Microsoft Works being the lower-end home package. Sadly, this affordable option was discontinued in 2009 and replaced by the Office Starter Edition. This was a pared-down version of Office, but it made changes to the way the older Works suite operated, forcing people to learn how to use the more business-focused app. There's a reason so many clung to the classic Outlook Express: it was easy to use and user friendly.

A truly free, limited edition of Office in the online space would be welcome and would likely mean a lot more people would be willing to stick with Microsoft's option, perhaps even upgrading when needed, but in terms of 365, this isn't really an option.



The most popular locally installed alternative of Microsoft's software is OpenOffice



Now discontinued, Koffice can still be downloaded

files and folders. It includes word processing, spreadsheets and presentations.

The world processing isn't as good as many alternatives, but we like the spreadsheet app. It may not be as powerful as local apps like Excel (let's face it, not many alternatives are, online or local), but it's better than a lot of alternatives. It's also very similar in operation to many standard office suites, so you'll instantly feel at home when using it.

OpenOffice
www.openoffice.org
We've talked about OpenOffice countless times here at Micro Mart, and that's for good reason, as it's simply one of the best free office suites around. It's not in the same style as Office 365 or Google Apps, as it's a locally installed package, but if you're looking for an office suite that is as close to MS Office as possible, this is probably the option for you.

Like Microsoft's package, OpenOffice features the usual assortment of modules such as word processing, spreadsheets, presentation, databases, an image editor and more. These are all connected, and each functions much the same as MS Office, with a similar GUI, so as long as you've used an office package before, you'll know the score here.

OpenOffice is open source, and it's cross platform, supporting Windows, Linux and Mac OS X. Like Google Apps, it also supports third party extensions that can add more functionality. This open-source nature means that authors of such extensions aren't limited by a controlling overseer, which means it has a major advantage over MS Office.

Koffice
www.kde.org/applications/office
This isn't as well known as many office suites, and it doesn't possess as many features, but does include three main modules (word processor, spreadsheet and presentation tool). It's also no longer supported and was taken offline in 2012. You can still find downloads for it online, and despite its discontinued state, it's still a viable alternative for those looking for a basic suite that does everyday tasks well.

It's another open-source option (built under KDE) that boasts cross-platform support, and the app is easy to use without all the bloat normally associated with more powerful and expensive options. This makes it great for new PC users and casual users who simply don't want all the fuss or cost of such complex packages.

LibreOffice
www.libreoffice.org
If OpenOffice is seen by many as the major alternative to MS Office, you could say LibreOffice is the alternative to the alternative. This is mainly because it's a 'fork' or developmental branch-off from OpenOffice using the same underlying source code, so it boasts many similarities.

One of the main benefits of LibreOffice over its parent project is the more active development, which seems to be graced with more updates and alterations than the more famous package. It's seen some great changes made to the core suite, including a PDF import tool, wiki publisher and more of a focus on extensions and user templates. Of course, it also has all of OpenOffice's core modules, so if you're after a suite that's always growing and you value new toys to play with, LibreOffice could be a perfect fit.

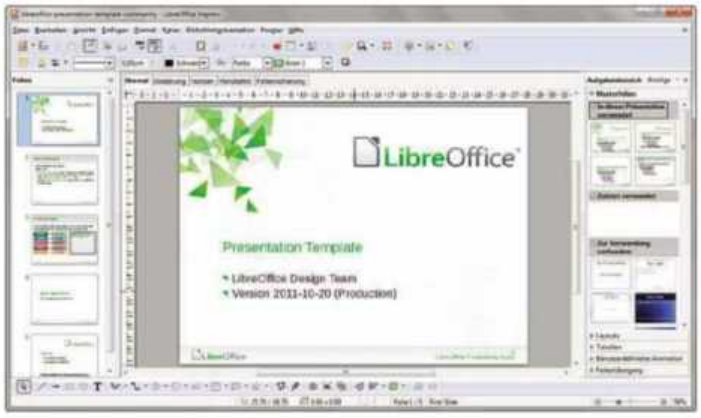
Data Migration

You may decide to give one of these alternatives a go and your next worry is your data, especially your collection of contacts contained within Outlook. How can you get this out of Office and into your new office suite? The answer will depend on your chosen package.

If you, like many others, are migrating from Office 365 to Google Apps, there are tools that can help you move your data. Specifically, there are options for moving data from Outlook to Gmail, some that cost money and others that are free. Perhaps the best option for most is Google's own free tool – Google Apps Migration for Microsoft Outlook. This can be grabbed from **tools.google.com/dlpage/outlookmigration**, and using it you can easily transfer your email data to Gmail. This includes contacts, messages, folders, calendar info and more. It's effective and takes much of the hassle out of manually moving data.

Even if you're not using Google Apps, but instead plan on using another office suite, it's an easy way to get your data out of 365 to another location that doesn't require a subscription.

If you're a business user wishing to move away from Microsoft Exchange to Google's option, there's even a tool for that, which can be found at **tools.google.com/dlpage/exchangemigration**, This allows the migration of Exchange data to Google Apps.



Perhaps even better than OpenOffice, LibreOFfice is another great free suite

If you prefer an easier method that may take away some of the effort, which could be useful if you've got a lot of data and/or accounts to migrate, it may be worth using a paid for tool. An example of this is Cloudiway (**www.cloudiway.com**). This is a dedicated service for migrating data from Office 365 to Google Apps. It handles the migration of mailboxes, OneDrive and Sharepoint. Of course, this is mainly an option for large scale users, and home users are unlikely to need such power, but there are more suitable options.

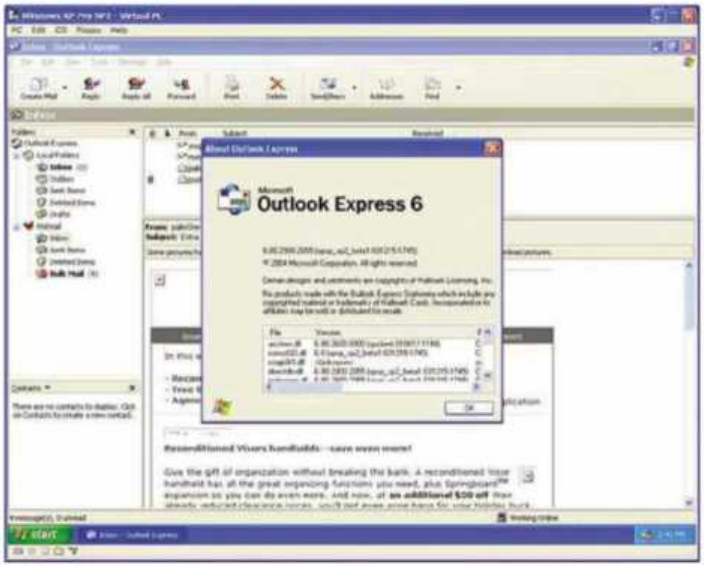
CloudMigrator is one. Found at **www.thecloudmigrator.com**, this is a tool that scales to the user, be they a home user with a single mailbox to migrate or an enterprise user who needs to migrate a whole company's worth of mailboxes. It moves mail, calendars, contacts and tasks.

"If you're a business user wishing to move away from Microsoft Exchange to Google's option, there's even a tool for that"

You don't need to use special tools or software to export your email data, however, and you can do so manually. This is really the best option, because it's free and caters for all users, regardless of the suite you wish to move to. All you need to do is export the data out of Outlook and into a .PST file, which most other email clients will accept an import from, as well as other formats. PST is the most commonly used.

To do this, within Outlook click File, and then select the Export option, and select the option to export to a file, and pick the .pst option. Now select the user folder of the account to be exported, and make sure you tick the 'Include subfolders' option. Browse to a location for the exported data file and click OK.

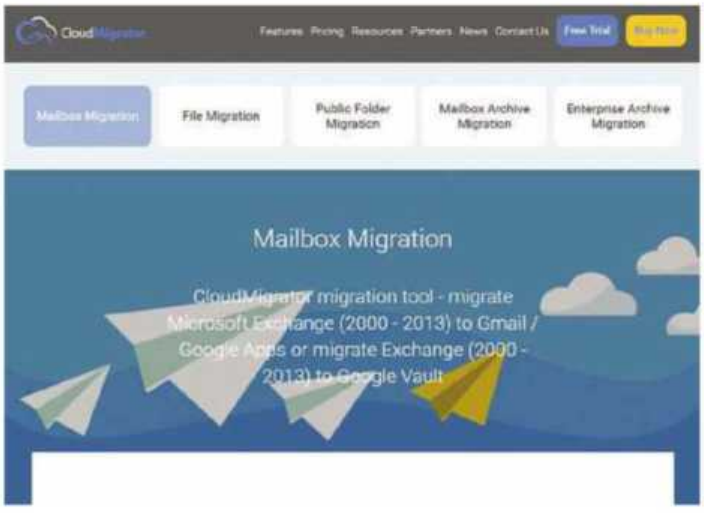
Outlook will export your data into the file, and this can then be used to import your data. What does this file contain, though?



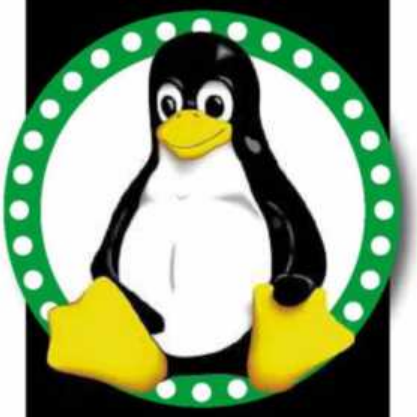
Outlook Express was a chamion for home user email but is now no longer available

A typical Outlook .pst export will migrate emails, contacts and calendar info. Emails will include attachments, and data is copied, not cut, so Outlook will retain all information. It's important to note that metadata is not exported. This includes permissions, folder properties and archive settings. This isn't a problem when moving to another program, as this information will usually be handled differently anyway.

As for other data, such as documents, spreadsheets and other work, it's simply a matter of saving items to your PC or another online storage location. That's all you need to do. There's no real trick to it and no need to worry about losing anything. Just carefully take your time and ensure you save all the important documents to a secure location. This is also a good idea generally for backup purposes. Online office suite may be secure, as they'll have better security than your own PC, but they can still have problems and downtime, so having data elsewhere is always a good habit to embrace. **mm**



CloudMigrator can help move your data to your new office home



Linux In A Browser

Taking a look at OpenRISC OR1K

David Hayward has been using Linux since Red Hat 2.0 in schools, businesses and at home, which either makes him very knowledgeable or a glutton for extreme punishment

We've seen a few examples of clever coders who have managed to get a working Linux distro inside a browser, but more often than not they tended to be a little slow and cumbersome using the likes of Firefox *et al*. This week, though, we've been playing around with Jor1K, an OpenRISC OR1K Javascript Emulator that runs Linux; and this one does the whole Linux in a browser concept justice.

It's No Jor1k

You can find the emulator running at **goo.gl/LWtewJ**. Once started, you can either enter 'Help' to read the latest documentation or, if you're already familiar, start tapping away. The emulator was developed by Sebastian Macke, with network support from Ben Burns. Gerard Braad, Neelabh Gupta and Lawrence Angrave also contributed to this worthy project, and you can communicate with the developers via the main site.

The emulator includes a number of games for you to try out. There are such treats as a *Monkey Island* demo, *Doom*, *Toppler* (a *Nebulus* clone), and remarkably, *Frontier: Elite 2*. Terminal-based games include *Frotz*, a solitaire clone, *Battleships*, *Hanoi*, and *Knight's Tour*. There are also a number of graphics demos, as well as benchmark too;s, alongside a C compiler, Lua, and the precision calculator language.

The networking side of things includes a graphical web browser, a tex-based browser, telnet, SSH, nmap, Git, and a SSHd server. There's even some parallel computing available, but that appears to be quite experimental at present.

Finally there's an X server available, with the likes of glxgears, Dillo, xTerm, xEyes, xClock, and xClac. Just to note, we haven't tried running the emulator within Dillo within the emulator itself yet, but it might be fun.

No RISCs, No Payoff

The emulator is really well put together, and split into two sections within the browser – with the terminal entry located on the left, and anything relating to graphics to the right. The left screen is connected to /dev/ttyS0 while the right is connected to /dev/fb0. You can alter some of the settings of the emulator, by tweaking the controls on the bottom of the left-hand pane, and you can change the core as well as enable or disable sound too. Needless to say, it's an incredibly well optimised piece of code, running at over 100MIPS in some instances.

It's an interesting project to play around with. There's enough to keep you entertained, and those who are a lot cleverer than us can use the environment as a sandbox for their programming or Linux commands – incidentally, you can run the infamous rm –rf / command line code without worrying what's about to happen to your own system.

Any More Examples?

This project has put us in mind of what else is out there, obviously of a Linux flavour, but we'll accept anything that can run inside the browser – even Windows ME at a push. Although, if you're less of a masochist, you could always try Windows 3.11 online from the Internet Archive at **goo.gl/AjiWu1** should you wish

If you've got any links to Linux distros in the browser, then please let us know. Or if you're working on a project like this, then write in and we can take a look.

Running Linux and within a browser? It's pretty good!

Apple Should 'Think Different' By Hitting Pause

WWDC 2016 will likely result in loads of new tech toys for devs, but Apple should fix existing ones first

As I write this column, WWDC 2016 is about to loom into view. Already, the sense of disappointment in the air is palpable; infinite hacks appear to be sharpening their crayons, in order to scrawl some bile about Apple's many failures that will become apparent during the kickoff speech.

It's crazy that a company which continues to make money hand-over-fist, and in many ways leads — or at least cleverly refines — the technology industry, finds itself in the position of perennial failure according to these commentators. The rewriting of history is commonplace, in a manner far beyond any reality distortion field Steve Jobs may have once erected. Often, you can now hear how the iPhone wasn't all that revolutionary after all, and how the Mac didn't really affect home computing that much. All the decisions Apple made were entirely obvious — it's just, for some reason, no-one else thought of implementing them first in consumer-facing products.

Looking ahead, Apple will fail multiple times during this WWDC, through not unveiling the iPhone 7, new iPads, a range of high-end displays, endless new Macs, an Apple car, a revamped Apple Watch, and eleven entirely new inventions that no-one had even heard of yet, but all of which will need to be bigger than the iPhone within a week, in order for Apple not to be doomed. Never mind that WWDC stands for Worldwide Developers Conference, and it's primarily about making things better for the people who make the apps everyone uses.

Ironically, it's *there* criticism should be levelled at Apple. For all its apparent problems, only dullards and vehemently anti-Apple ranters heavily rally against its hardware. You might be irked by pricing and artificially capped storage, but the iPhone, iPad, MacBook and iMac remain excellent products from a hardware perspective. Even the much-maligned Apple Watch has proven popular, in a field of hardware people too often forget is in its very early days.

In terms of software, however, you can't help but wonder whether the company needs to think different once again. Recently, Game Center for iOS was finally fixed, but it took a year – during which time countless games were rendered unplayable. On the Mac, the system remains a broken mess, presumably because Apple lacks the resources or interest to fix it. Beyond this, I too often hear from developers about APIs that Apple once excitedly introduced, only to immediately lose interest in, or that iCloud remains a pain to implement and unreliable in use.

In a sense, I'd be happy to see Apple CEO Tim Cook walk on stage and say: "We're going to do something different this year. We're going to do nothing new. Instead, we're going to spend an entire year making our software as bulletproof and reliable as possible. In 2017, we'll start looking at new features once again."

Such a move would benefit users of OS X, iOS, tvOS and watchOS, and set Apple apart from an industry always hell-bent on finding the next trinket. By the time this column goes to print, though, you'll have already seen there was never any chance of it happening, because Apple's on the same ridiculous treadmill as everyone else.

Technology companies must evolve or die, rapidly churning out new things to keep the masses happy. If that evolution produces the tech equivalent of an extra limb that keeps tripping you up, that's the price everyone has to pay.

▼ WWDC 2016: you'll know by now if it was more of the same, with emphasis on 'more'

Craig Grannell is a writer, designer, occasional musician and permanent loudmouth. He's owned Macs since 1996, when Apple was facing certain doom, and is therefore pleasantly surprised by its current success. Find **Craig** on Twitter at **@craiggrannell**

Moto-ing On

Ian McGurren looks at the latest version of a perennial favourite

Ian is a professional IT analyst, a semi-professional writer and a pretty amateur electronic musician. He likes gadgetry and loves making gadgets do things they were never designed to do

Motorola's Moto G, is a budget smartphone that showed the world that value and power could go together, upsetting the low end of the market at the same time. Since its introduction in 2012, it has arguably been the benchmark for budget price points, combining hardware and unbloated software that resulted in a throughly useable device – and one that put other, more expensive, phones to shame. Given that Motorola Mobility was owned by Google when it first launched, what you got was a Nexus phone on a budget, but without the budget compromises.

Admirably, the second generation Moto G further improved on the debut with a larger screen, 4G and a microSD slot, and it sold loads more once again. However, by the time the third generation arrived, it needed more than the minor spec bump it got in order to compete with the likes of the Vodafone Smart Ultra and (for the first time) it was left playing catch up. This begs the question: can the fourth generation bring the crown back to the Moto G name, and to new owners Lenovo?

First thing you notice with the Moto G4 is that the quality is closer to that of a mid-range handset than it is a budget one, with many pundits citing its similarity to the Moto X. The case is thinner and the design more refined, though there's still a fair bezel at the top and bottom. The mid-range look does also come with a mid-range price, though – certainly in the case of the Moto G4 Plus, more on which later.

The hardware headline is not only is the screen half an inch bigger at 5.5", but the resolution has finally been bumped to 1080p. When last year's model sported an (admittedly good) 720p screen, understandably questions were raised, though the high power with a lower resolution argument was a fair one. This time the CPU has been boosted to a dual-quad core Snapdragon 617, so there's power to push the screen without dragging the device down. Coupled with a minimum of 2GB RAM and either 16GB or 32GB storage, the Moto G4 is a swift and snappy performer.

That 2GB also helps run the latest version of Android, version 6.0.1 Marshmallow, though how the upgrade path to Android N will fair now Google is no longer Motorola's owner isn't clear. For now you get a 99% vanilla version of Marshmallow, with none of the bells and overbearing whistles of other OS skins. Some might say that's dull, but frankly Android is already an attractive and well-designed operating system out-of-the-box.

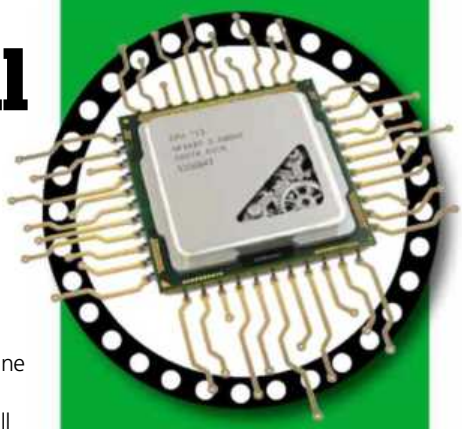
So, the the Moto G4 Plus (or Moto X Minus, if you like). As with the Moto G 3rd generation, there is more than one version of the handset, only with the Moto G4 it's much more clearly defined. Contrary to what you might first think, the G4 Plus isn't a bigger, phablet version, but rather offers an improved 16MP camera, more memory options (up to 4GB RAM and 64GB storage) and, most obviously, a fingerprint reader ready for Android Pay.

All those extras are indeed impressive, though they come at a cost that takes the Moto G4 Plus out of 'budget' territory. A 4GB/64GB model will set you back £264.

The budget market is in a bit of an odd place at the moment. The Moto G shook it up but, at under £100 many of the handsets are pretty average. The best reside at just over that price, especially if you're willing to gamble on a Chinese import. The Moto G4 is above those at the top of the budget range, but it's a very good phone with support and heritage – you know what you're getting, and you can try it out and buy it on your high street. If I were in the market for a budget Android handset, and had the £169 for the basic version at the Moto Maker website, I'd find it hard to resist. The Moto G name remains untarnished.

Mobile

Mirror, Signal, Method Call



Andrew Unsworth gets whacked out on SCUBA snaps and examines the latest car security issue

Like many tech enthusiasts I have a keen interest in in-car technology and autonomous vehicles. Computer technology has been present in cars for decades to control engines and other safety-critical systems. However, such technology is now far more conspicuous. Dashboards are increasingly decked out with large touchscreens that allow users to control all aspects of a car, from the temperature of individual seats to throttle and steering response. Mercedes Benz's COMAND infotainment system even lets you read the owner's manual for your motor, although we'd recommend you do this with the car made safe and not when you're bombing it down the M3.

This interactivity is all good, and it makes cars a much more personal and welcoming place to be, but incorporating general-purpose computer technology into the automobile does have its problems. A major problem is that of interconnectivity. Connecting your car to a network or a mobile device is massively convenient, but it also brings risks, as a story on our sister website **Alphr.com** (**tinyurl.com/j3543s5**) shows.

The story details the work of a security research firm called Pen Test Partners, which says it successfully hacked the computer system of a Mitsubishi Outlander PHEV SUV. Full details of the hack can be found on the Pen Test Partners website (**tinyurl.com/h9yox88**), but, in a nutshell, the hack is made possible by the way the car's mobile app connected to the vehicle. Once the car was hacked, Pen Test Partners says it was able to disable the alarm, among other things. There is a fix to prevent the hack, though, and this is also detailed on the Pen Test Partners website.

This is worrying, and it follows hot on the heels of stories concerning the hacking of keyless entry systems, such as this one in *The Guardian* (**tinyurl.com/k3vrhvp**). Networked, general-purpose computer technology is not just desirable in automobiles, it will become an integral part of them as they become autonomous, but we're still at the nascent stage of this process, so problems will crop up. However, the prospect of someone making off with an expensive motor is a scary one, even if it is insured. Let's hope the car companies wise up to these issues soon and invest more time and money in computer security.

Underwater Love

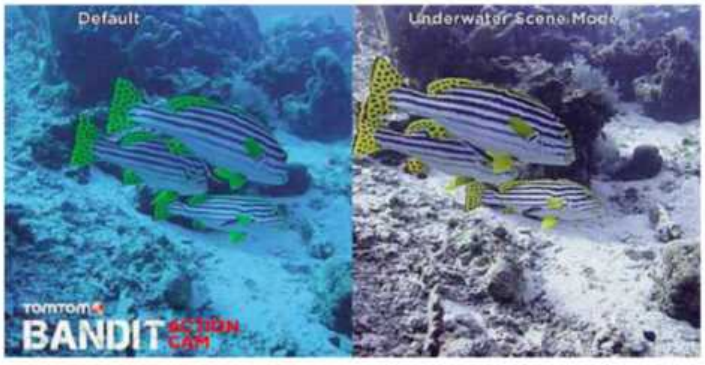
Actioncams are all the rage now, and while there are many big names in the market (such as the popular GoPro and iON brands), there are other manufacturers in the game too. For example, although it's commonly associated with Satnav systems, TomTom also makes the Bandit actioncam (£200 from **www.johnlewis.com**). The Bandit is a 16MP, Full HD affair, although according to Tomtom's website it can also record Ultra HD video at 15 frames per second (fps).

The Bandit has various sensors that allow it to recognise movement, rotation, speed and so on, which is great for those whose interests include bunnyhopping over a 200ft ravine sideways. However, those who prefer more leisurely pursuits will be keen to put the Bandit's optional dive lens cover (£30, also from **www.johnlewis.com**) to use, especially given the latest update to the Bandit's software.

This update allows the Bandit to detect water colour and intensity and apply a red filter to remove blue and green colours from footage. TomTom says that this results in "vibrant, balanced underwater colour". You can judge for yourselves using the image located elsewhere on this page. In my subjective opinion, the filter has improved contrast and made the yellow colour on the fishes' tails and fins look more colourful and vibrant. TomTom has published a video to YouTube for comparison, too (**tinyurl.com/zewlre5**).

I've always wanted a camera that I can take underwater. I can get a waterproof casing for my ultrazoom camera, but the cost of it is more than the cost of a TomTom Bandit. Of course, other waterproof cameras exist, and are available to buy on the GoPro (**shop.gopro.com**) and iON (**tinyurl.com/gmvrolm**) websites, among others.

All the actioncams are waterproof or resistant to different depths, so make sure you pick one that suits your needs.



Andrew Unsworth has been writing about technology for several years, he's handy with a spanner, and his handshaking skills are second to none

Ryan Lambie has loved videogames since he first stared up in awe at a *Galaxian* arcade cabinet in his local chip shop. 28 years on, Ryan writes about gaming for Micro Mart. He's still addicted to chips and still useless at *Galaxian*

Rise Of The Machines?

Like something out of the Terminator, Elite Dangerous's non-player craft have been building their own deadly super-weapons

This week, Ryan looks at the scary NPC uprising in Elite Dangerous, and finds out how Overwatch has been faring over its first few days of release....

Plug & Play

For a few days in late May, *Elite Dangerous* really lived up to its name. In scenes that more closely resembled a dystopian nightmare than a sprawling space opera, the game's AI ships started building their own super weapons and aggressively attacking human players. Word of these rampant NPCs began to circulate on Reddit and other message boards as players complained that non-player ships that could normally be taken out with ease were instead turning on them and destroying their craft within seconds. One user complained that he'd died eight times in a row – racking up $8m in in-game costs replacing his damaged ship – without managing to reclaim any bounty to make up for it.

"I either have to quit playing the game until this is fixed or I have to take up trading or exploring," MuttonChops24 wrote. "I literally cant afford to fight anymore."

As similar reports stacked up, Frontier began to investigate. The root cause of the problem could be traced back to an update called *The Engineers*, which launched on the 26th May. One element of that update was an alteration to higher-ranking enemy craft, intended to make them more challenging to defeat in battle. What Frontier hadn't reckoned on was that *Elite Dangerous*' new and improved NPCs would effectively start cheating; the AI craft had begun creating their own hybrid super-weapons that far outstripped the power of those available to a human player.

"All new and never before seen (sometimes devastating) weapons were created," Frontier's community manager explained, "such as a rail gun with the fire rate of a pulse laser."

These weapons, combined with the more aggressive AI, meant that players were constantly being menaced by NPC craft, with all but the most well-armed and fastest ships powerless to defeat them in combat. Frontier was quick to point out in its forum post that *Elite* wasn't about to be gripped by a "Skynet-style uprising", however. Rather, the hybrid weapons were caused by "some form of networking issue which allowed the NPC AI to merge weapon stats and abilities."

In order to quell the revolt, Frontier has come up with a simple work-around: it's taken away the NPCs' super-weapons away from them. The aggressive AI still remains, but without those big guns, the enemy craft are no longer quite as dangerous. This will, Frontier says, "allow us to investigate the issue and address a key bug."

For now, the panic appears to be over – that is, unless *Elite*'s AI somehow figures out a way of getting its guns back again. "I for one welcome our new NPC overlords," a forum user wrote. "It was only a matter of time before they hacked our laws of physics, and taught us ugly sacks of mostly water a thing or two..."

Online

Blizzard may have been expecting big things from its hero shooter *Overwatch*, and perhaps unsurprisingly – given the glowing reviews it's already received – the clamour has been huge. In fact, Blizzard has announced that seven million players joined the game within the first 10 days of its release. Collectively, those players have spent more than 119 million hours blasting away at each other, and have switched characters some 326 million times. While we're on

Blizzard's Overwatch is off to a great start with seven million players signing up in the first 10 days of its launch

the subject of statistics, the current user base may be down somewhat on the 9.6 million users who logged in for the beta, but bearing in mind that *Overwatch* is a premium release rather than free-to-play, it's still been a promising first few weeks for the fledgling shooter.

One aspect of the game that was conspicuous by its absence at launch was *Overwatch*'s Competitive mode. Available during the game's closed beta, the competitive mode allowed players who'd reached level 25 to compete in a range of divisions in order to unlock rewards and other items. In late May, however, Blizzard announced that it had decided to disable the mode for *Overwatch*'s launch, with game director Jeff Kaplan explaining that Competitive was being "redesigned" following feedback from closed beta players. In a live interview, Kaplan went onto describe the reasons for the delay in a little more detail.

"Some of the things we wanted to change: one was the season length," Kaplan said. "We heard a lot of complaints from the community that they felt one-month seasons were too short. We thought there was a lot of cool about one-month seasons – in particular *Hearthstone* does it really well. But we realise our game is different from *Hearthstone* so we decided to go with seasons that are probably going to be more around three months. Even more specific than that: you'll probably have a two-and-a-half month actual season with maybe a couple of weeks off in between, just to build excitement and give a little bit of a reset."

The good news? *Overwatch* players don't have too much longer to wait. Blizzard recently announced that it's sticking to its original plan to have the Competitive mode ready for the end of June. Soon, the shooter's most dextrous players will be able to test their mettle against the best in the world.

Incoming

If you thought existence as a space trader was scary in *Elite Dangerous* of late, spare a thought for poor Hello Games. For the past couple of years, the UK-based developer's been hard at work on *No Man's Sky,* its own spin on the space trading concept established by the original *Elite* way back in 1984. After months of hype and anticipation, the game's finally due for release this summer – albeit a bit later than we'd initially hoped. Originally scheduled to come out in June, *No Man's Sky* has been pushed back to August in order to give the developers more time.

Now, while we can understand would-be players being disappointed by the delay, we're baffled by Hello Games' claims that the announcement had triggered death threats. "I have received loads of death threats this week," studio boss and designer Sean Murray wrote on Twitter, "but don't worry, Hello Games now looks like the house from *Home Alone*."

Here's hoping the response doesn't distract the studio; if *No Man's Sky* can live up to its promise, then it could be one of the most exciting games of 2016. We'll know for sure when *No Man's Sky* is released, hopefully on August 12th. **mm**

Hello Games' delay of No Man's Sky has apparently triggered death threats from some quarters. Sigh

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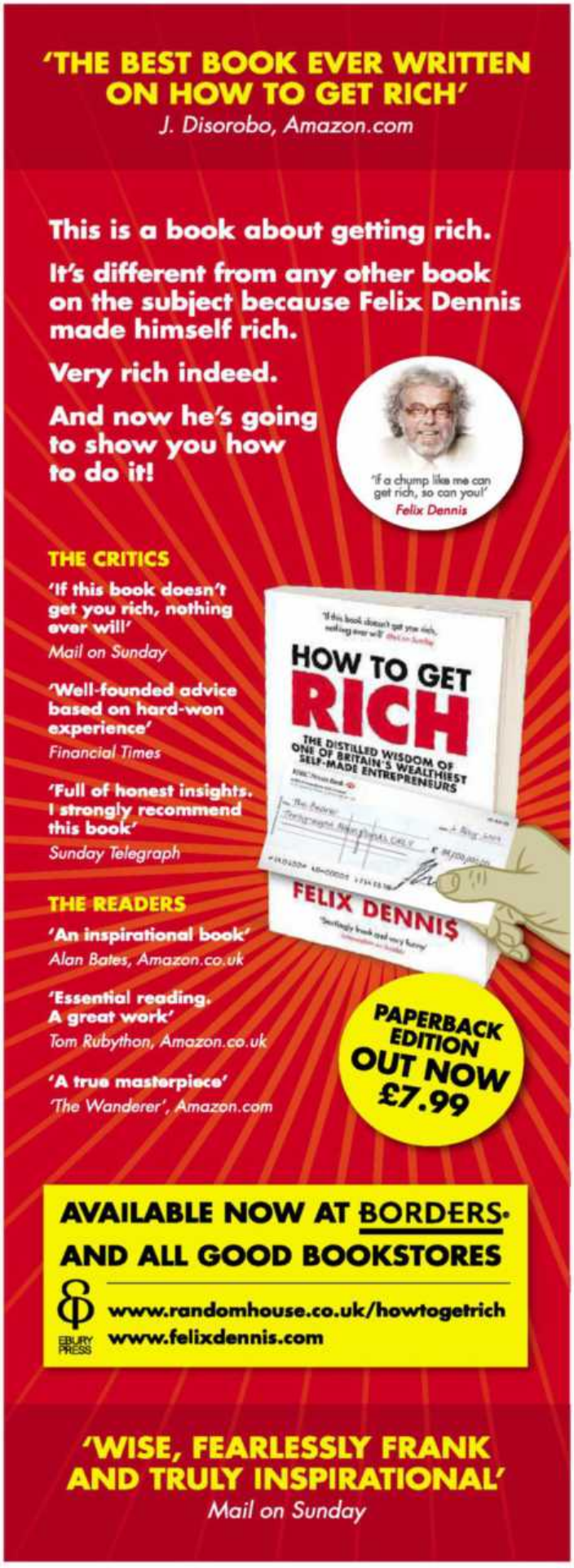

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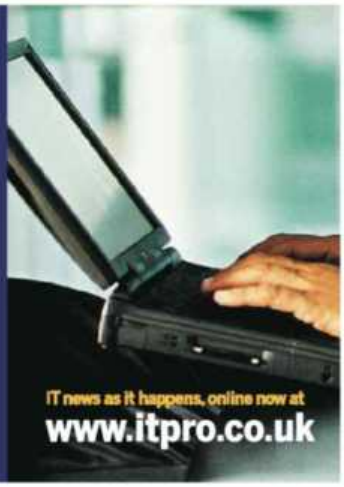

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Please try to keep your queries brief and limit them to just one question per letter, simply so we can squeeze in as many as we can each week. Please include relevant technical information too.

Aaron

Selective AutoPlay

I have built a new computer using a Hero VIII motherboard and installed Windows 7 Pro 64-bit (OEM) onto a SM951 M2 drive.

Computer spec:

- Asus Hero VIII motherboard,
- Intel 6700K
- 16GB RAM
- Samsung SM951 M2 drive for OS
- 2 x Asus DRW-24F1MT drives
- 2 x Seagate 2TB hard drives
- Sandisk 256GB SSD
- Asus GTX960 graphics card

Windows was installed from one of the DVDs using a modified installation disc created with the Asus EZInstaller and appeared to install okay. Windows installed in UEFI mode (disc partition GPT). Up to this point, I have not set up Windows update for fear of getting Windows 10 installed.

Now I'm starting to install software but have hit a problem when installing from a CD or DVD – installing from a USB drive works okay.

When I insert a DVD or a CD to install any programs, the drive LED light flashes for a moment, but AutoPlay does not run.

Note: AutoPlay does run okay when a USB drive is inserted or even when a USB 2TB external disc drive is inserted. It just doesn't work when a CD or DVD is inserted in the drive. Now here's the strange thing...

Selecting 'Computer' from the Start menu or opening Disc Management while a DVD is inserted will get the drive running, and AutoPlay will open.

The same applies to music CDs: they will not start Media Player until either 'Computer' or Disc Management is opened.

Also, perhaps even stranger, inserting a USB drive while a DVD or CD is in the drive will get the DVD drive running and AutoPlay will open. Actually, two instances of it open: one for the USB drive and one for the DVD drive. It seems the DVD drive needs a kick to get it going.

I have checked the usual suspects (according to Google):

The settings in AutoRun are correct.

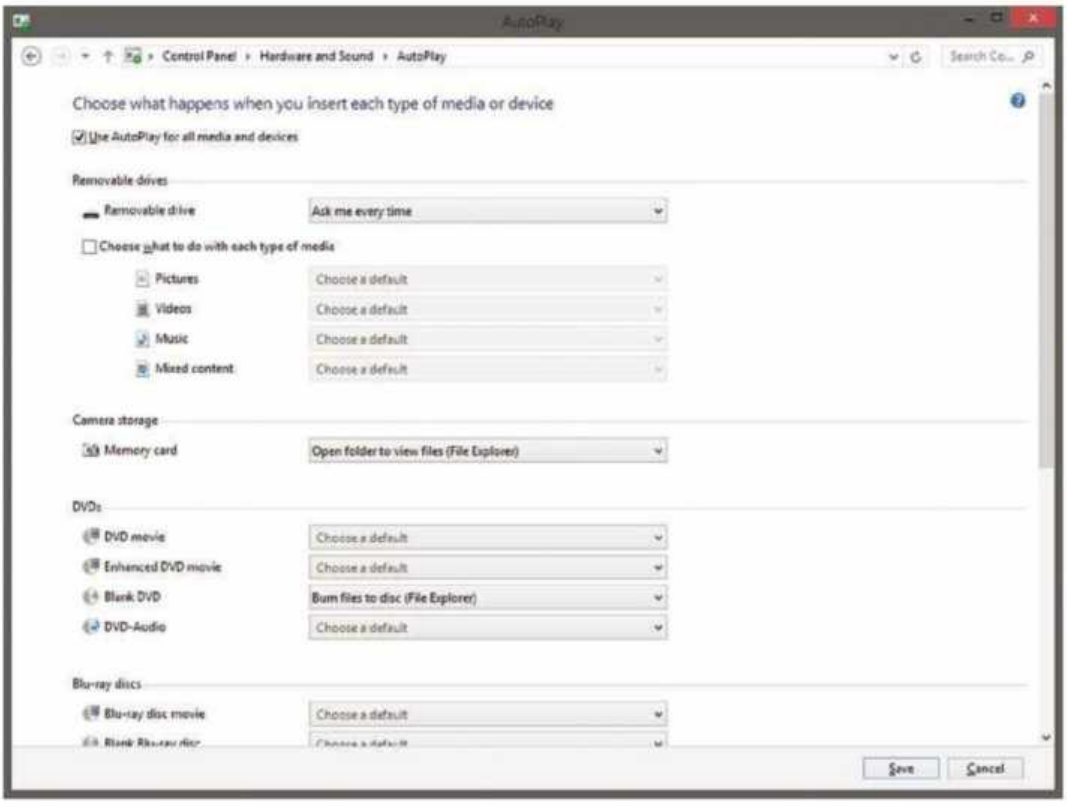
The registry entry HKEY_LOCAL_MACHINE\System\CurrentControlSet\Services\CDRom has AutoRun set to 1, which is correct.

I have checked in registry for the following entry: HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Policies\Explorer for the entry NoDriveTypeAutoRun

However, the folder (or should I say key?) 'Explorer' does not exist in this new computer, though it does in my other computer, which works, and the entry is set to DWORD NoDriveTypeAutoRun Reg_DWORD 0x00000091 (145)

I have created Explorer and NoDriveTypeAutoRun set to 145, but this does not cure the problem.

I have now noticed that if a disc is inserted into the DVD drive shortly after the computer



Check the AutoPlay settings in Control Panel for any incorrect entries

has been started, that AutoPlay works okay, but if it is left too late it does not work, so presumably some program or service that runs at start-up is stopping it working correctly, but how do you find out what that is?

I am considering reinstalling windows again from scratch, as there is virtually nothing on it, but as I used an OEM version of Windows, which I have now activated, would there be any problem with activating it again on the same computer ?

Any help in resolving this would be appreciated.

Nick

I agree that this is certainly an odd one, but AutoPlay has often been known to behave in rather strange ways, despite its relatively simple task.

You've already tried a couple of fixes I see, including a manual check of the AutoPlay registry settings, which is good. However, it's also often a good idea to stick with the basics first, and by this I mean the AutoPlay options in Control Panel.

You'll find these in Control Panel under Hardware and Sound > AutoPlay. Here you'll find a page that contains all of the possible actions AutoPlay can take, including any prompts for your input. Go here, and make sure that all of the options listed are set up correctly. There's a chance something could be set incorrectly.

The AutoPlay service could be a problem too, with the first being the closure of any programs that could cause issues with AutoPlay. A good way to do this would be to reboot Windows into Safe Mode as nothing else loads. Unfortunately, this also applies to AutoPlay, so Safe Mode isn't an option. Instead you'll need to edit your start-up procedure to omit most items. Do this by clicking Start > Run and typing 'msconfig'. Now pick the 'Selective startup' option and untick the start-up items. You could try using 'Diagnostic startup' too if you like. This will allow you to boot up with minimal interference.

Another trick that could help is a simple command in command prompt. To use this, open up an admin command prompt and type 'net start shellhwdetection' and press Return. Reboot your PC and try AutoPlay again.

*Finally, Microsoft has an actual repair tool for AutoPlay that can diagnose and fix some problems. It's been discontinued on the official Microsoft site, but you can still find it online from various download sites, including Softonic (**goo.gl/n4un3D**). Use this program to scan your system and to attempt a repair of AutoPlay.*

Snip Snip

I used to use Windows Print Screen function all the time to take screenshots of applications and programs in Windows, as I make little guides for people under my care who are learning how to use computers (I work in a retirement home). A while ago, I changed this, as I found the Windows Snipping tool. I found this much more useful as it gave me more control over what I capture, including the ability to capture specific areas of a screen instead of the whole display.

The only problem is accessing the Snipping tool is a little more complicated, as it's an actual program and not a simple key press. If possible, though, I'd love to be able to use the Snipping tool in the same was as the Print Screen key, and was hoping you could provide some advice.

Meg

The Snipping tool in Windows is a great little extra a lot of people remain totally unaware of, and it's an evolution of Print Screen of sorts, with more functionality. Unlike Print Screen, which is a simple clipboard and runs as a service, the Snipping tool is an actual program, and is located in Windows > System32 and is called SnippingTool.exe.

As you've said, it's harder to access than a simple key press, so many still simply use Print Screen, because it's far easier. You can change this, though, and can even bind a shortcut key to the Snipping tool.

To do this, you'll need to either locate the Snipping tool's shortcut or create a new one. The existing shortcut should be found in C:\ProgramData\Microsoft\Windows\Start Menu\Programs\Accessories (assuming your OS is installed on C, if not, replace the drive letter to the corresponding value). Once you find it or create a new one, right-click it and select Properties. Select the Shortcut key box and then press the key you'd like to use for the shortcut. If you wish, you can also use combinations, such as Shift+F6 or any other combination. Just be careful not to pick something that clashes and could interrupt another useful shortcut. Once you're done, click Apply, and the Snipping tool will be set to the shortcut you specify. Easy.

If you wish, you could also right-click and drag the program or shortcut icon to the desktop or onto the Taskbar for easy access.

As a side note, if any readers still prefer the simplicity of the Print Screen key, there's a simple way to maximise its usefulness, and that's the active window capture. This will only capture the currently active window instead of the whole screen and save it to the clipboard. To do this, simply press Alt+Print Screen.

The Windows Snipping tool is a useful screen capture utility

You an set up a shortcut key combo for the Snipping tool via its shortcut properties

ASK JASON

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Jason

Delayed Gratification

I have two Intel NUC systems with Windows 7, and I use them for running Windows Media Center in the lounge and conservatory. These tiny PCs work really well, and with the SSDs I've fitted they're also quiet. I'd upgrade to Windows 10, but as you know, Media Center is no longer a feature (though I believe it can be made to work unofficially). I find the alternatives clunky, and they rarely seem to grab EPG data accurately.

Now, as the free Windows 10 upgrade is due to finish on 29th July, what's the best plan to make sure I don't miss out but also don't lose my current setup? I'm thinking I could buy a couple of cheap HDDs, connect them to my NUC systems and install Windows 10, then put the SSDs back. Windows 10 would then be ready and waiting – I could clone the HDDs to the SSDs when I choose to go ahead with the upgrade. Would this work? Is there a better solution?

Gordon Moore, Gmail

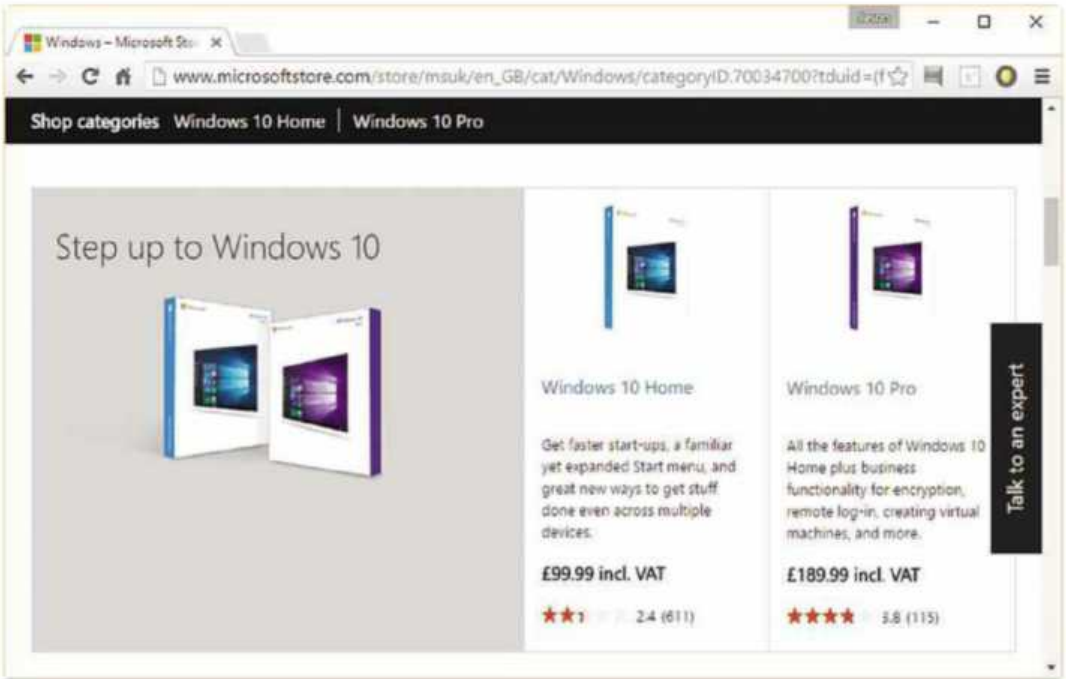
I admire your ingenuity, but I think you're on a hiding to nothing. The problem here is activation. The Windows 10 installs will have to be activated, and you'll need to use your Windows 7 product keys to do that. My understanding is that Microsoft would then block those keys, so your Windows 7 installs probably wouldn't work – not fully or legally, anyway. Microsoft would be daft not to lock things down this way.

You could try the idea the other way round, Gordon. Upgrade your Windows 7 installs to Windows 10, clone the SSDs to the HDDs, then roll back to Windows 7 (thirty days are allowed for that). Your current setups would then continue to work as normal, but I confess I've no idea if Microsoft would revoke activation on the Windows 10 installs when you hooked up the HDDs some time down the line. Possibly not, so long as the Windows 7 installs were wiped. I guess no-one will know how such a scenario plays out till after 29th July.

> **"Your current setups would continue to work as normal"**

I reckon the free-upgrade period may well be extended. Windows is almost a dirty word, tarnished by recent mistakes and an ever-shrinking mobile market-share. The official cost of Windows 10 Home is £99.99 – £189.99 for the Pro version. Buyers of new PCs will effectively get the OS for nothing, so the audience for retail or OEM copies will just be self-builders and upgraders. If people still running Windows 7 haven't been persuaded to upgrade for free, why on earth would they shell out big money after July? I fancy that sooner rather than later Windows 10 Home will be free to anyone who wants it, upgrade or not.

Any takers?



Touching The Surface

I'm interested in a Surface Pro 4. I'm a self-employed salesman and do a great deal of travelling. With one of these, I'd have a laptop for entering orders and so on and also a tablet for chilling out in hotel rooms. I know there are cheaper alternatives, but none seem to match the functionality, durability, and downright desirability.

One thing concerns me: performance. The base model, which is all I can really afford, uses a Core m3-6Y30. Is this just a fancy name for an Atom? I've used Atom-based devices before – including the Surface 3 – and they just don't cut it. What are your thoughts?

L Hall, TalkTalk

No, the Core m-series chips (Skylake-Y), and also the older Core M chips (Broadwell-Y), aren't Atom-based. They're not low-fat affairs. Really, they're just slightly modified versions of the regular Core i-series chips. However, they run at ultra-low voltages and operate within tablet-level TDPs. All models, even the top-end Core m7-6Y75, are designed to operate within a TDP of 4.5W.

Having said that, Intel allows manufacturers to run the chips outside that TDP if a device requires it and is built to handle it. For example, the Core m3-6Y30 in the entry-level Surface Pro 4 has a base speed of 900MHz, a Turbo Boost speed of 2.2GHz, and sticks to the 4.5W TDP. It's fanless. Conversely, exactly the same chip in the entry-level 2016 MacBook has a base speed of 1.1GHz, the same Turbo Boost speed, and a 7W TDP. It's still fanless but obviously has a beefier cooling solution. Apple has gone this route so that the chip can run in Turbo Boost mode for longer spells without overheating.

So, will the base Surface Pro 4 meet your needs? As ever, this depends on usage. If you're going to use it as a tablet and for general office tasks, it'll probably be fine. The chip is effectively a slow Core i3 but with Turbo Boost (this is missing from Core i3s). If your needs are more demanding, I'd advise moving up the model ladder. The top-end Surface Pro 4, with a Core i7-6650U, starts – starts! – at £1,299. The model you're considering starts at £749. Quite a difference. In the middle, you get a Core i5-6300U, with prices starting at £849. That's the sweet-spot, I'd say.

PS – You'd also need a Type Cover – a keyboard. That's another £109.99. The Surface Pro 4s are beautiful things and hugely practical, and Microsoft deserves the success its seeing. But the prices alone mean they're not aimed at consumers (certainly not the one writing these words!). Of course, as you're a salesman, my friend, you're exactly the sort of customer they are aimed at.

Microsoft's Surface Pro 4 hybrids are best-in-class – and I can't afford one!

Network Notwork

I've just taken delivery of a new PC. It's running Windows 10, which I've had no trouble adapting to (I've come from Windows 7). But I've got a problem! The PC sits on a network along with a Windows 7 system and an iMac running OS X 10.11.x (El Capitan). All are connected to a Gigabit Ethernet switch. The transfer rate is 70–100MB/s. Except for the Windows 10 machine, that is. This receives data at that rate, but it transmits data at only 6–8MB/s!

Why? All drivers are up-to-date. After some online research, I thought I'd found the solution – disable Large Send Offload for the Windows 10 PC's network adaptor. There are two entries for this in my case – one for IPv4, one for IPv6 – but both are disabled already! What's going on?

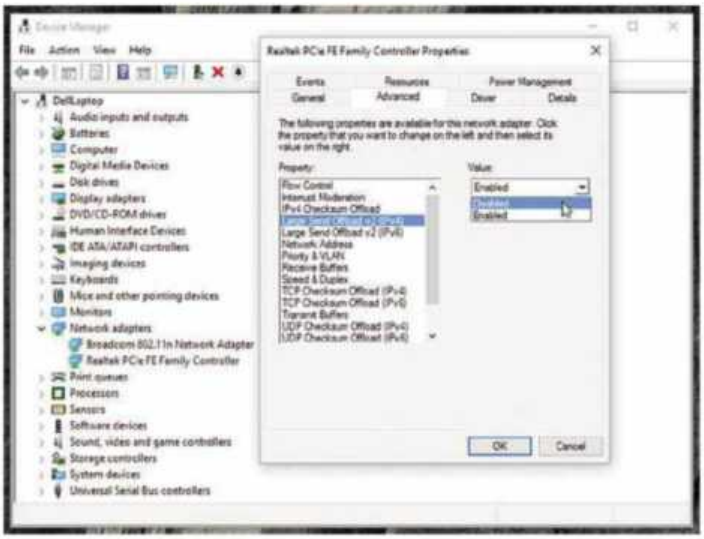
Ian Sloan, Gmail

You're not alone, Ian. This seems to affect a fair few Windows 10 users. As you say, success often results from disabling Large Send Offload. For readers who want to try that, find the entry for the PC's network adaptor in Device Manager and double-click it. In the window that appears, hit the Advanced tab. All of the adaptor's settings will be there for the taking.

Another option is to disable UAC. To do that, open Control Panel and click User Accounts > User Accounts > 'Change User Account Control settings'. In the new window, move the notification slider right down to 'Never notify'. I advise against doing that, however, if I'm honest. UAC is an important security mechanism. Still, it's worth seeing if it solves the problem.

*Is the culprit actually Windows 10, though? Does the slowdown occur when transferring to *either* of the other machines, or just one? Could one be getting the auto-negotiation wrong and knocking down the protocol from 1Gbit to 100Mbit? Also, maybe you've got a nasty kink in one of the cables or a faulty port in the switch. Experiment, Ian – swap cables and ports around. Does the transmission slowdown then occur on a different system? What say other readers? I've no more ideas...*

Does Windows 10 have trouble with wired networks?



Crowdfunding Corner

Kickstarter isn't just good for starting new things – it's also a good way to launch a product based on an established idea when traditional investment fails. This week, we've got two products based on existing properties that you might want to help to completion

Fable Fortune

When Microsoft killed-off Lionhead Studios recently, it left a lot of people wondering what would happen to the *Fable* games in the future – not least Flaming Fowl Studios, who were working on one at the time! So it is that *Fable Fortune* has come to Kickstarter, seeking £250,000 to complete and release the game.

Set in the whimsical world of Albion, *Fable Fortune* will be a free-to-play collectible card game being launched on PC and Xbox One with mobile versions to potentially follow. Inspired by the Fable Pub Games that were so popular with the launch of *Fable II*. Approved by Microsoft and given access to all of the Fable characters and locations, this game has the potential to scratch your *Fable* itch while you wait to see what Microsoft does next.

Since the game is free anyway, Kickstarter backers receive a variety of in-game rewards, not to mention access to exclusive in-game events. The cheapest tier costs just £5 and gives you developer forum access, a forum badge, free tournament entry, a guild seal card back, and access to the closed Beta – not to mention any future rewards. A variety of other opportunities are available including – for £5,000 – the ability to appear in the game itself!

The beta starts in August 2016, so if you're excited to play the latest incarnation of a much-beloved franchise, you've got a couple of weeks to get on board and it won't be long until it's ready to play.

URL: kck.st/1sx969X
Funding Ends: Tuesday, June 28th 2016

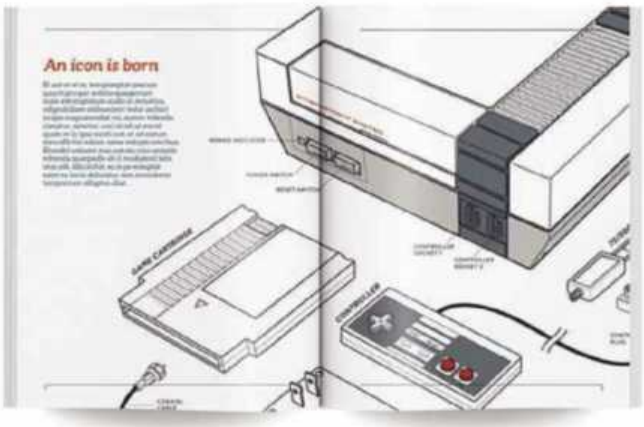
Nintendo Entertainment System/Famicon: A Visual Compendium

Bitmap Books has an admirable track record of producing successful visual compendiums of retro game graphics and hardware using Kickstarter, and its latest project is looking to continue this winning streak. This book sees it's attention turned to the much-beloved NES (known as the Famicom in Japan) in an attempt to cover some of gaming's most revered and beloved icons in it's unique style.

The popularity of the previous projects means even now, with weeks to go, this one has smashed its goal and already unveiled a number of stretch goals. At present every book is 402 pages, with four gatefolds, metallic inks, a bookmark ribbon, a vinyl sticker and an exclusive 10-track audio CD – and who knows what else it'll include before the project is out! Relive the incredible visuals of your favourite game franchises like *Mario*, *Metroid*, *Zelda* and more, presented in gorgeous detail with high-end design standards and aesthetics.

£10 gets you a PDF of the book, while £25 gets you the softcover version, and £35 the hardback. You can also buy add-ons to your pledge like a postcard pack or poster. The book will be ready in January 2017 and if the last few are anything to go by, it's going to be great.

URL: kck.st/1PiDY2W
Funding Ends: Friday, July 1st 2016



Disclaimer: Images shown may be prototypes and Micro Mart does not formally endorse or guarantee any of the projects listed. Back them at your own risk!

App Of The Week

Dark Sky

Something a little more accurate than seaweed or red skies at night for predicting the weather this week

Being British, we have a morbid fascination with the weather - an almost pessimistic view on just how bad the day will turn out should we decide to have a barbeque on the beach. We can't help it; perhaps it has something to do with us living in a country that takes great pleasure in raining on a bank holiday?

Weather forecasts these days aren't really up to much either. Where once we may have sat glued through monotonous news reports to catch the latest weather updates from the weatherman/woman, these days we're happy to take a quick glance at our phones and shrug our collective shoulders as rain is once more forecast.

There is an alternative, though, in the form of Dark Sky, an app that has, since its launch on iOS, received such adulation that it's difficult to ignore. More to the point, it now has an Android version.

John Kettley Hasn't Got Anything On This

Dark Sky is accurate; scarily accurate. It's an app that can predict the weather down to the minute.

Thanks to being able to use several weather satellites, geo-monitoring stations and those things that every other house has pinned to the roof of the shed, Dark Sky is able to tell you the minute it'll start raining and the minute it'll stop.

Unbelievable as it sounds, we tested that claim with a family day out in Cromer on the Norfolk coast. Since it was a family day out, a bank holiday weekend and it was on the Norfolk coast, there was a pretty good chance that it would rain – and we weren't wrong.

Dark Sky accurately predicted the rain to start at 09:32 and by my watch it started at 09:31. Furthermore, it predicted that the rain would stop at 11:54, but this time it was a little out, as my watch had the rain stopping for 12:03. Amazingly, the app claimed that the rain would restart at 14:16, which it did.

Aside from an almost shaman-like quality for weather prediction, Dark Sky also features reports from around the globe, a daily summary, a week ahead look at the forecast, a detailed radar view in real time of the weather and some maps that reveal the weather as it was in the past and what it'll be in a week's time.

There are also custom alerts for you to set up, so if you're not interested in the rain, you can set one up for snow, intense sunshine or anything that could affect your driving conditions. It'll even bring the forecast to your lock screen.

Features At A Glance

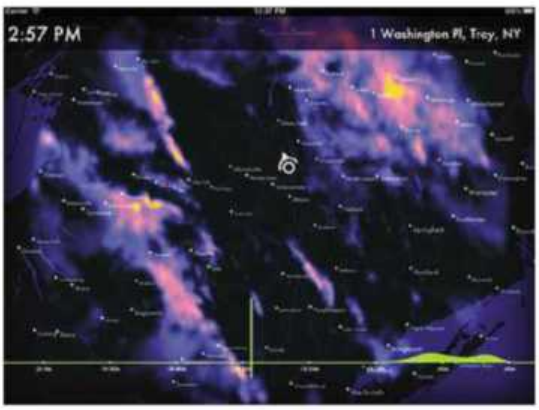
- Amazingly accurate weather prediction.
- Wonderfully detailed maps.
- Exact location weather updates.
- Radar view and customised alerts available.

And Neither Has Michael Fish!

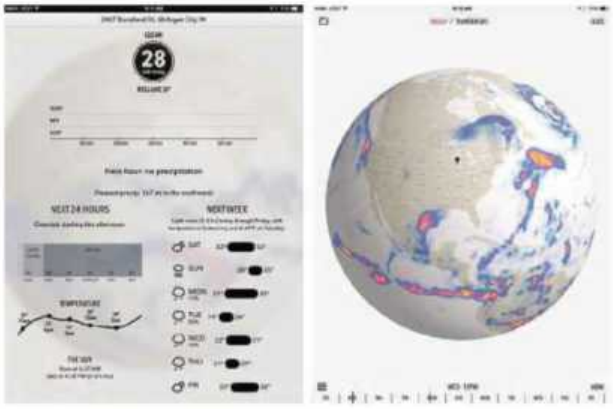
The free version is more than capable of delivering an accurate weather report, but for £2.53, the Premium version features widgets, more alerts, summaries and countless other benefits.

If you're the sort of person who finds it necessary to know the weather at any given point in time, from anywhere in the world, then you'll be in meteorological heaven with Dark Sky. **mm**

Dark Sky is an amazingly accurate weather prediction and forecast app



The radar view is quite spectacular looking



And the maps and forecast for the week are equally impressive too

Logging Off

I did something this week I'd solemnly stated I'd never do: I started using Office 365. Maybe I've got a foot stuck in the 20th century, but I intrinsically dislike the notion of 'renting' software. So what changed my mind? Well, it was practically free, in a manner of speaking. You see, a few months back when Microsoft made their generally unpopular changes to the default storage for OneDrive I may have intentionally abused that situation.

Realising what was very likely to happen I pre-loaded my OneDrive account with pictures exceeding 10GB of space, because before the change I had the 15GB camera roll option from reviewing a Windows Phone.

By way of recompense Microsoft gave anyone who used more than the 5GB of space that OneDrive now comes with a free one-year subscription to Office 365 Personal. That's a single install, but it is free!

However, that would still leave me paying £6 a month for that software a year down the line, surely? Maybe... But then I did something entirely counter-intuitive, I bought Office 365 Home on a one month rolling contract. Why, you might ask? Well, at the point I did that, it immediately upgraded my Office 365 Personal to Home version, which you can install on five PCs (or Macs), five tablets and five smartphones for a payment of £8 – but for me the next payment isn't now due until 13 months from now. What's more, I have one year to effectively cancel that, or set it to not auto-renew, and I will have had all those Office 365 licenses for that time for £8.

What's really interesting about this loophole, though, is that it's been known about for some time, but for whatever reason Microsoft has chosen not to close it. I've also been told that you can extend the time before you have to pay even longer if, by some chance, you get other free Office Personal codes.

One way to get these is to buy a cheap Windows tablet (like the Linx ones) that comes with a free year-long Office 365 subscription. A quick look around found the Linx EM-I8270 7" Tablet selling on Amazon for £56 that fitted this bill –though there may be cheaper options out there.

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When you consider that Office 365 Home costs either £8 a month or £80 a year (from Microsoft), then the tablet is effectively free, if not an actual discount.

From what I also understand, these Office licenses stack, so it's possible to extend out for a number of years the evil day when you have to pay Microsoft, by various means.

The trick I believe is to load up your Personal licenses before then buying the Home subscription, because if you use a product key for Personal when you've already got Home Microsoft will offer you a choice of either sticking with home, downgrading your extra time to nine months, or switching back to Personal. Though I'm not sure if you couldn't then buy Home again, and get your cake and eat Microsoft's too, so to speak.

Perhaps I'm been suckered into using something I'll end up having to pay for at some point, and maybe that's the angle, but I can't help thinking it's also the result of Microsoft not really thinking their licensing model through completely.

Mark Pickavance

LAST WEEK'S CROSSWORD

Across: **7** Constellation, **8** Regexp, **9** Au Fait, **10** Isotron, **12** Realm, **14** Boson, **16** Pattern, **19** Kakuro, **20** Phoebe, **22** Liquid Crystal.

Down: **1** FOVE, **2** Ascent, **3** Sempron, **4** Alias, **5** Stifle, **6** Social VR, **11** Slovakia, **13** Rapport, **15** Oculus, **17** Taoism, **18** NODDY, **21** Bias.

DISCLAIMER

The views expressed by contributors are not necessarily those of the publishers. Every care is taken to ensure that the contents of the magazine are accurate but the publishers cannot accept responsibility for errors. While reasonable care is taken when accepting advertisements, the publishers cannot accept any responsibility for any resulting unsatisfactory transactions. Whether or not you give the slightest damn about boxing, or sport in general, you probably had an opinion on Muhammad Ali. He seemed like the kind of guy who would demand you did. We must confess that we have been to a few boxing events in our time, and have watched the awesome *When We Were Kings* on more than one occaission – but it's not really Ali's achievements in the ring that really drew us to him, more what he did out of it. In fact, our favourite Ali story comes from the aforementioned documentary, that tells the tale of his 'Rumble In The Jungle' with George Foreman, but has nothing even remotely pugilistic about it. Towards the end of the film, journalist George Plimpton tells a tale of Ali being asked to come up with a poem off-the-cuff when giving a speech to Harvard Graduates, his contribution - either "Me. We." or "Me. Whee!", depending on who you believe – turned out not to be a wonderful demonstration of his verbal dexterity, and gift for the profound (or bravado), but also a *bona fide* contender for being the shortest poem ever written. It was certainly shorter than the incumbent, a verse called *Upon The Antiquity Of Microbes*, which eloquently informs us that "Adam had 'em".

THIS WEEK'S CROSSWORD

Across

7 The relationship between the proportional decrease in a lateral measurement to the proportional increase in length in a sample of material that is elastically stretched. (8,5)

8 One of a pair of chemosensory sense organs positioned laterally on the head of a nematode. (6)

9 The aggregate of actively swimming animals in a body of water ranging from microscopic organisms to whales. (6)

10 In music an interval or chord spanning an octave and a fifth in the diatonic scale, or a note separated from another by this interval. (7)

12 A Titan who was forced by Zeus to bear the sky on his shoulders. (5)

14 Inert gas especially towards oxygen. (5)

16 The first month of the year in the Julian and Gregorian calendars and one of seven months with the length of 31 days. (7)

19 A job that runs in the background on the IBM 3090 mainframe computer in such a way that it uses only those CPU cycles not needed by other work. (6)

20 A computer graphics architecture for Silicon Graphics computer workstations. (6)

22 A small quadrupedal dinosaur of the late Cretaceous period, having a bony frill above the neck and probably ancestral to triceratops. (13)

Down

1 Its method could be 'get' or 'post'. (4)

2 An isogram connecting points receiving equal amounts of sunshine. (6)

3 A smokeless explosive made from nitrocellulose, nitroglycerine, and petroleum jelly, used in ammunition. (7)

4 A pulse that synchronises the start of the horizontal picture scan line in a CRT monitor with the picture source that created it. (Abbr) (5)

5 Basic component of communication over a network. (6)

6 A mythical monster with the head of a bull and the body of a man; slain by Theseus. (8)

11 Things that are extremely or unusually large - or big porkies. (8)

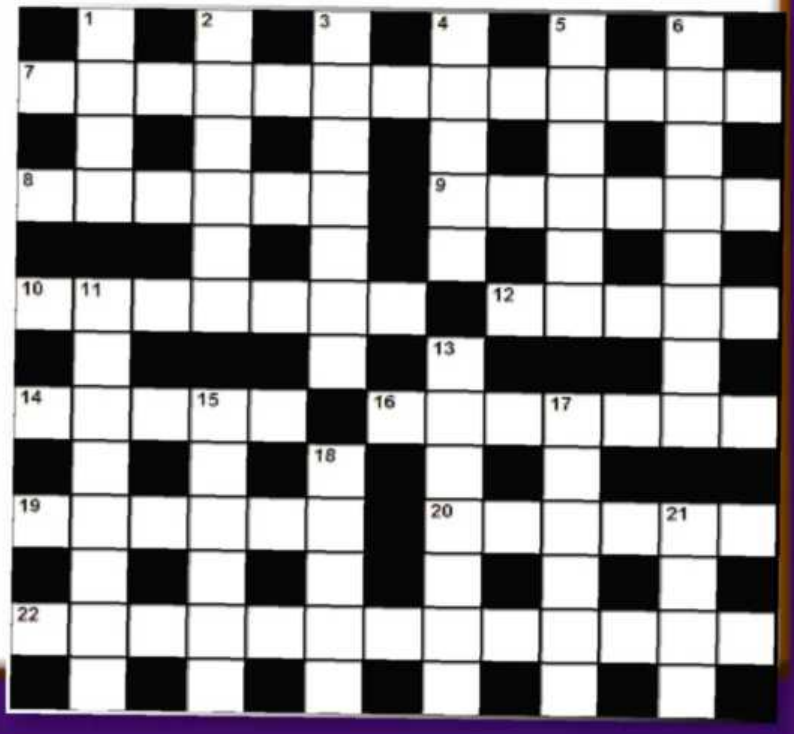
13 The internal diameter or bore of a gun barrel. (7)

15 A crescent-shaped prehistoric stone implement. (6)

17 Presumptuously arrogant. (6)

18 A game played between a human and a pet in which the human throws an object for the pet to retrieve. (5)

21 A function that reads data from a source, leaving the source data unchanged and writes it elsewhere. (4)



Top 5 Bad Places For Windows To Crash

We love Windows crashing – most of the time…

1 A Bank Or Building Society

Maybe we're just being fussy, but we can't say it's particularly reassuring when you're sitting down with a mortgage advisor or bank manager, and they're using a PC that's running Windows XP. But it's probably perfectly fine, and at least it's running. It would be much more scary if you saw their PCs blue-screening when they're accessing your bank account.

2 A Train Station or Airport

Just saying the word 'crash' anywhere near public transport is probably akin to mentioning the Scottish play among a crowd of theatre lovies. And if you're waiting to board a train or plane, you want to think that all the technology that you'll be relying on is working properly. The good news is that the really important stuff probably runs on something more robust than a Microsoft operating system – at least we hope it does.

3 A Really Important Part Of A Game

There are few things in life more infuriating than unskippable cut-scenes in games. Why do they even exist? Now imagine getting towards the end of a particularly long one. Then think how annoying it would be if you finished one, but before you got to save your game, Windows crashed. Next time you load that game up, you'll need to watch the whole cut-scene again.

Unfortunately, this is not theoretical. This is something that's actually happened to us.

4 In A Computer Shop

Considering how many machines are on display in the average PC store, it makes sense that one or two of them might misbehave – law of averages and all that. But if you're hoping to sell computers to people, it still doesn't look good if the ones you have on show are throwing a tantrum.

5 On Stage

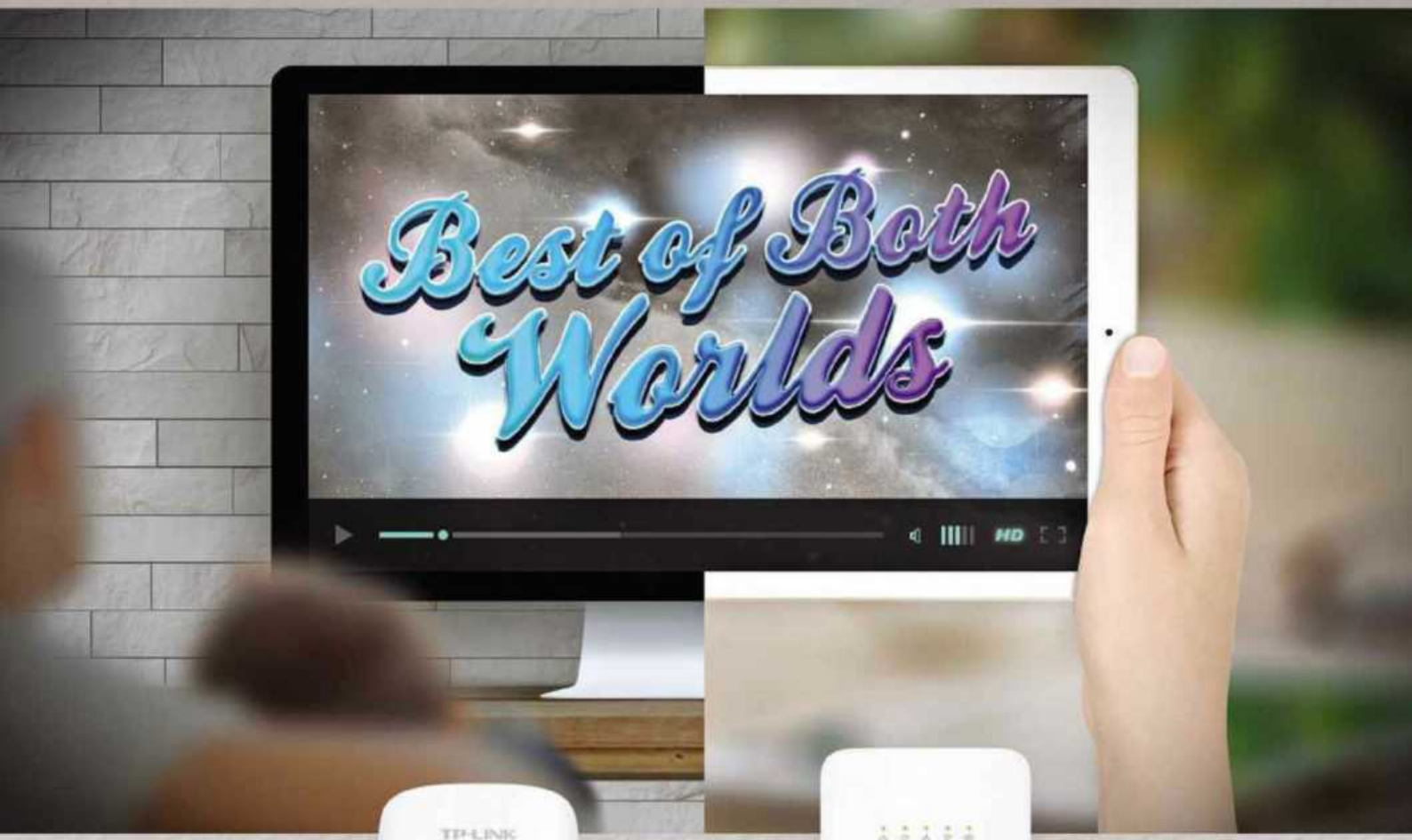
If you're responsible for setting up a Windows device or computer before the big boss gets up on stage to demonstrate it, you better hope it works. We don't reckon Bill Gates was too happy when Windows 98 crashed in a public demo (**youtu.be/yHxj-47csUU**), and Microsoft executive Steven Sinofsky probably wasn't too chuffed either, when his Surface tablet decided to stop working on stage (**youtu.be/4QRWa68MtLc**). **mm**

▲ *Everyone's favourite (most hated) error screen*

HIGH-SPEED

WIRED & WIRELESS

CONNECTIONS



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